INDEX

1. Introduction .....................................................................................................................................3
2. Function / terminal programming methods ..................................................................................4
  2.1 Defining an input for a certain function on keypad .................................................................6
3. Winder application control basics ................................................................................................7
  3.1 Starting direction .....................................................................................................................7
  3.2 References and actual values .................................................................................................. 8
4. Control I/O .....................................................................................................................................10
5. Winder Application – Parameter lists ...........................................................................................11
  5.1 Monitoring values [Control keypad: menu M1] .....................................................................11
  5.2 Basic parameters [Control keypad: Menu M2 → G2.1].................................................................14
  5.3 Input signals [Control keypad: Menu M2 → G2.2].................................................................15
  5.4 Output signals [Control keypad: Menu M2 → G2.3] ..............................................................19
  5.5 Drive control parameters [Control keypad: Menu M2 → G2.4] ............................................21
  5.6 Prohibit frequency parameters [Control keypad: Menu M2 → G2.5] .....................................21
  5.7 Motor control parameters [Control keypad: Menu M2 → G2.6] ...........................................22
  5.8 Protections [Control keypad: Menu M2 → G2.7]...................................................................24
  5.9 Autorestart parameters [Control keypad: Menu M2 → G2.8] ...............................................26
  5.10 Winder Parameters [Control keypad: Menu M2 → G2.12] .....................................................26
  5.11 Fieldbus parameters [Control keypad: Menu M2 → G2.13] ..................................................28
  5.12 Keypad control [Control keypad: Menu M3] ...........................................................................28
  5.13 System menu [Control keypad: M6] ......................................................................................28
  5.14 Expander boards [Control keypad: Menu M7] .......................................................................28
6. Description of parameters ............................................................................................................ 29
  6.1 Basic parameters ................................................................................................................... 29
  6.2 Input signals ........................................................................................................................... 31
  6.3 Line references and actual signal selections .......................................................................36
  6.4 Output signals ........................................................................................................................ 40
  6.5 Drive control ........................................................................................................................... 45
  6.6 Motor control .......................................................................................................................... 50
  6.7 Protections ............................................................................................................................... 54
  6.8 Autorestart parameters ........................................................................................................ 63
  6.9 Closed loop parameters......................................................................................................... 66
  6.10 Advanced open loop parameters .......................................................................................... 68
  6.11 Monitor settings ..................................................................................................................... 69
  6.12 Winder parameters .............................................................................................................. 69
  6.13 Setting profibus .................................................................................................................... 75
  6.14 Keypad control parameters ................................................................................................... 77
7. Control signal logic in Winder Application ................................................................................... 79
8. Fault codes .................................................................................................................................... 80
Winder Application for NXP (APFIFF26V120)

1. INTRODUCTION

Select the Center Winder Application in menu M6 on page 56.2. This application is mentioned for closed loop motor control.

The Winder Application can be used for the control of winder or unwinder drives. The winder operation is possible in both open loop and closed loop control modes (NXP + encoder on the motor shaft). The unwinder operation requires the closed loop control mode. This application can control the tension of the material to an approximately constant value through the radius range, without the aid of tension feedback devices. The application also supports tension and speed feedback devices to get more accurate operation. The radius can be estimated by comparing the line speed reference with the actual drive speed or it can be measured.

The control system receives reference values for line speed and material tension. The conversion to motor speed and torque is based on the radius.

- The Winder application has to know the radius to be able to operate.
- The line speed reference is always needed regardless of operation mode
  - In line tension control, the line speed reference can be replaced by actual line speed.
  - In line speed control, the drive also needs information about the actual line speed.
- The Winder Application has the same I/O control logic as the Multipurpose Application.
- The Start command is always given through DIA1 and/or DIA2 and the motor rotation direction is determined in line speed control mode as direction of web and in tension control mode as direction of torque.

Additional functions:
- Torque compensation while accelerating or decelerating in tension control
- Static friction compensation
- Viscous friction compensation
- Web break monitoring
- Open loop torque linearization
- Programmable Start/Stop and Reverse signal logic
- Reference scaling
- One frequency limit supervision
- Second ramps and S-shape ramp programming
- Programmable start and stop functions
- DC-brake at stop
- Programmable U/f curve and switching frequency
- Autorestart
- Motor thermal and stall protection: Programmable action; off, warning, fault
2. FUNCTION / TERMINAL PROGRAMMING METHODS

There are two methods for programming the input and output signals for the NX drives. The first method is called FTT or Function To Terminal, the other method is called TTF or Terminal To Function.

In FTT the terminal appears as a parameter and the user defines what function he wants to be activated for the specific terminal. This is the traditional way of I/O programming. See Figure 1

In the figure, the function “Run Enable” is connected to DIN3.

In TTF, the different functions appear as parameters and the user defines the terminal he wants to connect the function to. This method allows a flexible use of additional I/O boards. See Figure 2

In the figure, the function “Run Enable” is connected to Slot A Terminal 3 = DIN3, “External Fault” to DIN6, “External Fault, inverted” to the virtual board with value TRUE, i.e. NOT active, “Acc/Dec time sel” to the virtual board with value FALSE, i.e. NOT active.

The first letter describes the Slot (0 = virtual slot) and the number is the index number of the terminal. Depending on the option board, there can be several (or no) inputs and/or outputs available. If there are both inputs and outputs on the same board the first input is named A.1 but the first output is also named A.1.

NOTE!
With this method is it possible to have several signals connected to one hardware input, but only one signal can be controlling one hardware output.

Tel. +358 (0)201 2121 • Fax +358 (0)201 212 205
Each option card can have up to 10 inputs and/or outputs of each type, but all 10 are not necessary used on every board (the amount of terminals causes limitations).

The standard option cards are described in Figure 3.

NXOPTA1 in slot A has:
- 2 analog inputs, referred to as A.1 and A.2 when programming.
- 6 digital inputs, referred to as A.1...A.6 when programming.
- 1 analog output, referred to as A.1 when programming.
- 1 digital output, referred to as A.1 when programming.

NXOPTA2 in slot B has:
- 2 digital outputs available, referred to as B.1 and B.2 when programming.

Some of the I/O’s on the same board are referred to with the same letter-number combination (e.g. A.1). Note, however, that they represent different types of I/O’s. Each type numbering starts from 1.

Functions that are not used are programmed to the “virtual board” in slot 0. Depending on the needed value or level, the number is set to 1, 2 or 3.
2.1 Defining an input for a certain function on keypad

Connecting a certain terminal (input/output) to a certain function is done by giving the parameter an appropriate value. The value is formed of the Board slot on the Vacon NX control board (see Vacon NX User’s Manual, Chapter 6.2) and the respective signal number, see below.
3. **WINDER APPLICATION CONTROL BASICS**

3.1 **Starting direction**
Select starting direction as shown below.

### 3.1.1 Speed control
Motor starting direction is the same as the line direction seen from the shaft end.

#### Winding
- **Unwinding**
  - Line direction: Clockwise
  - Motor torque: Clockwise

#### Rewinding
- **Rewinding**
  - Line direction: Counter Clockwise
  - Motor torque: Counter Clockwise

### 3.1.2 Tension control
Motor starting direction is defined as direction of torque. Regardless of the drive being an unwinder or a rewinder.

#### Winding
- **Unwinding**
  - Line direction: Clockwise
  - Motor torque: Clockwise

#### Rewinding
- **Rewinding**
  - Line direction: Counter Clockwise
  - Motor torque: Counter Clockwise

---

**Supported Feedbacks**

<table>
<thead>
<tr>
<th>Tension control</th>
<th>Open Loop (NXS/P)</th>
<th>Closed Loop (NXP)</th>
<th>Supported Feedbacks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Radius</td>
<td>Tension</td>
<td>Act. Speed</td>
</tr>
<tr>
<td>Rewinder forward</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Unwinder forward</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Rewinder reverse</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Unwinder forward</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Speed control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rewinder forward</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Unwinder forward</td>
<td>(Contact factory)</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Rewinder reverse</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Unwinder forward</td>
<td>(Contact factory)</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>
### 3.1.3 Generating side operations

When the motor is in the generating side (unwinding or making fast ramping stop) the motor power is fed to the DC-link of the frequency converter. If that power aren’t used anywhere the motor cannot produce the necessary tension torque or maintain the line speed. Therefore the drive must be equipped with a brake chopper and a brake resistor. The brake chopper is activated with parameter 2.4.5. The brake resistor parameters can be found in the system menu. The internal brake resistor is rarely sufficient for this kind of operation.

### 3.2 References and actual values

#### 3.2.1 Requirements for radius calculation

The Winder application needs the radius value to be able to operate. The radius value can be given through an analogue input or a fieldbus. In tension control mode, the radius can be calculated from the line speed reference and the actual motor speed. In speed control mode, the radius can be calculated from the line speed reference and the actual line speed.

#### 3.2.2 Speed control

When using the speed controlled mode, the drive needs the line speed references and the actual line speed or the actual radius.

#### 3.2.3 Slack recovery

Slack recovery removes slack from line. When slack recovery function is active the drive is in speed control.

When the slack recovery parameters 2.9.4.3 and 2.9.4.4 are set to zero, the drive will immediately work under speed reference or torque reference.

The Winder application works under slack recovery, until the set time has expired and there is enough torque on the motor shaft. After the slack recovery, references are switched to correspond to calculated radius and line speed references or the line tension reference.

The unwinder tension control mode is always used in slack recovery. The drive gives torque according to tension and the speed is limited to slack recovery frequency.

#### 3.2.4 Tension control

When using the tension control, it is recommended to use the line speed reference value, which is used by the line speed controller, since the actual line speed measurement delay may cause miscalculation of inertia torque. The line speed reference must be ramped externally slower than the line speed controller can achieve. Otherwise the drive receives a wrong value of line speed, which causes miscalculation of radius and/or inertia compensation.

#### 3.2.5 Requirements for inertia compensation

Inertia compensation needs the correct radius value and an accurate speed value. Because the actual line speed value is often unstable or there is delay in measurement it is recommended to use the line speed reference.
Direct roll to roll winding

Direct roll to roll winding with tension feedback

Rewinding Speed control

Unwinding Tension control Closed loop

Line direction

Line speed ref
Line tension ref

Line speed act

NXP

Line speed actual

Line tension actual

Line speed ref
Line tension ref

NXP

24-hour support +358 (0)40 837 1150 • Email: vacon@vacon.com
### 4. CONTROL I/O

#### NXOPTA1

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+10V ref</td>
<td>Reference output Voltage for potentiometer, etc.</td>
</tr>
<tr>
<td>2</td>
<td>AI1+</td>
<td>Analogue input, voltage range 0—10V DC Voltage input for line reference or actual Programmable</td>
</tr>
<tr>
<td>3</td>
<td>AI1-</td>
<td>I/O Ground Ground for reference and controls</td>
</tr>
<tr>
<td>4</td>
<td>AI2+</td>
<td>Analogue input, current range 0—20mA Current input line reference or actual Programmable</td>
</tr>
<tr>
<td>5</td>
<td>AI2-</td>
<td>I/O Ground Ground for reference and controls</td>
</tr>
<tr>
<td>6</td>
<td>+24V</td>
<td>Control voltage output Voltage for switches, etc. max 0.1 A</td>
</tr>
<tr>
<td>7</td>
<td>GND</td>
<td>I/O ground Ground for reference and controls</td>
</tr>
<tr>
<td>8</td>
<td>DIN1</td>
<td>Start forward (programmable) Contact closed = start forward</td>
</tr>
<tr>
<td>9</td>
<td>DIN2</td>
<td>Start reverse (programmable) Contact closed = start reverse</td>
</tr>
<tr>
<td>10</td>
<td>DIN3</td>
<td>External fault input (programmable) Contact open = no fault Contact closed = fault</td>
</tr>
<tr>
<td>11</td>
<td>CMA</td>
<td>Common for DIN 1—DIN 3 Connect to GND or +24V</td>
</tr>
<tr>
<td>12</td>
<td>+24V</td>
<td>Control voltage output Voltage for switches (see #6)</td>
</tr>
<tr>
<td>13</td>
<td>GND</td>
<td>I/O ground Ground for reference and controls</td>
</tr>
<tr>
<td>14</td>
<td>DIN4</td>
<td>(programmable)</td>
</tr>
<tr>
<td>15</td>
<td>DIN5</td>
<td>(programmable)</td>
</tr>
<tr>
<td>16</td>
<td>DIN6</td>
<td>Fault reset Contact open = no action Contact closed = fault reset</td>
</tr>
<tr>
<td>17</td>
<td>CMB</td>
<td>Common for DIN4—DIN6 Connect to GND or +24V</td>
</tr>
<tr>
<td>18</td>
<td>A01+</td>
<td>Output frequency Programmable Range 0—20 mA/R, max. 500Ω</td>
</tr>
<tr>
<td>19</td>
<td>A01-</td>
<td>Analogue output Programmable Open collector, Is≤50mA, Ui≤48 VDC</td>
</tr>
<tr>
<td>20</td>
<td>DO1</td>
<td>Digital output READY Programmable</td>
</tr>
</tbody>
</table>

#### NXOPTA2

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>RO1</td>
<td>Relay output 1</td>
</tr>
<tr>
<td>22</td>
<td>RO1</td>
<td>RUN</td>
</tr>
<tr>
<td>23</td>
<td>RO1</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>RO2</td>
<td>Relay output 2</td>
</tr>
<tr>
<td>25</td>
<td>RO2</td>
<td>FAULT</td>
</tr>
<tr>
<td>26</td>
<td>RO2</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Winder application default I/O configuration.

**Note:** See jumper selections below. More information in Vacon NX User’s Manual, Chapter 6.2.2.2.

**Jumper block X3: CMA and CMB grounding**

- CMB connected to GND
- CMA connected to GND
- CMB isolated from GND
- CMA isolated from GND
- CMB and CMA internally connected together, isolated from GND

= Factory default
5. **WINDER APPLICATION – PARAMETER LISTS**

On the next pages you will find the lists of parameters within the respective parameter groups. The parameter descriptions are given on pages 29 to 77.

**Column explanations:**

- **Code** = Location indication on the keypad; Shows the operator the present parameter number
- **Parameter** = Name of parameter
- **Min** = Minimum value of parameter
- **Max** = Maximum value of parameter
- **Unit** = Unit of parameter value; Given if available
- **Default** = Value preset by factory
- **Cust** = Customer’s own setting
- **ID** = ID number of the parameter [used with PC tools]
- **=** In parameter row: Use TTF method to program these parameters.
- **=** On parameter code: Parameter value can only be changed after the frequency converter has been stopped.

### 5.1 Monitoring values (Control keypad: menu M1)

The monitoring values are the actual values of parameters and signals as well as statuses and measurements. Monitoring values cannot be edited. See *Vacon NX User’s Manual, Chapter 7* for more information.

#### 5.1.1 Basic monitoring values

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Unit</th>
<th>ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1.1.1</td>
<td>Output frequency</td>
<td>Hz</td>
<td>1</td>
<td>Output frequency to motor</td>
</tr>
<tr>
<td>V1.1.2</td>
<td>Frequency reference</td>
<td>Hz</td>
<td>25</td>
<td>Frequency reference to motor control</td>
</tr>
<tr>
<td>V1.1.3</td>
<td>Motor speed</td>
<td>rpm</td>
<td>2</td>
<td>Motor speed in rpm</td>
</tr>
<tr>
<td>V1.1.4</td>
<td>Motor current</td>
<td>A</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>V1.1.5</td>
<td>Motor torque</td>
<td>%</td>
<td>4</td>
<td>In % of the nominal motor torque</td>
</tr>
<tr>
<td>V1.1.6</td>
<td>Motor power</td>
<td>%</td>
<td>5</td>
<td>Motor shaft power</td>
</tr>
<tr>
<td>V1.1.7</td>
<td>Motor voltage</td>
<td>V</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>V1.1.8</td>
<td>DC link voltage</td>
<td>V</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>V1.1.9</td>
<td>Unit temperature</td>
<td>°C</td>
<td>8</td>
<td>Heatsink temperature</td>
</tr>
<tr>
<td>V1.1.10</td>
<td>Motor temperature</td>
<td>°C</td>
<td>9</td>
<td>Calculated motor temperature</td>
</tr>
<tr>
<td>V1.1.11</td>
<td>Voltage input</td>
<td>V</td>
<td>13</td>
<td>AI1</td>
</tr>
<tr>
<td>V1.1.12</td>
<td>Current input</td>
<td>mA</td>
<td>14</td>
<td>AI2</td>
</tr>
<tr>
<td>V1.1.13</td>
<td>DIN1, DIN2, DIN3</td>
<td></td>
<td>15</td>
<td>Digital input statuses</td>
</tr>
<tr>
<td>V1.1.14</td>
<td>DIN4, DIN5, DIN6</td>
<td></td>
<td>16</td>
<td>Digital input statuses</td>
</tr>
<tr>
<td>V1.1.15</td>
<td>Analogue Iout</td>
<td>mA</td>
<td>26</td>
<td>AO1</td>
</tr>
<tr>
<td>V1.1.16</td>
<td>Active faults</td>
<td></td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>V1.1.17</td>
<td>PT100 Temp.</td>
<td>°C</td>
<td>42</td>
<td></td>
</tr>
</tbody>
</table>

*Table 2: Basic monitoring values*
5.1.2 Winder monitoring values

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Unit</th>
<th>ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1.2.1</td>
<td>Winder radius</td>
<td>%</td>
<td>1504</td>
<td>Radius on keypad has not been limited via minimum radius or maximum radius (100%) to confirm the correct actual and/or reference values scaling. Internally used radius is limited from minimum radius to 100,00 %.</td>
</tr>
<tr>
<td>V1.2.2</td>
<td>Line speed reference</td>
<td>%</td>
<td>1505</td>
<td>Used line speed reference value</td>
</tr>
<tr>
<td>V1.2.3</td>
<td>Line speed actual</td>
<td>%</td>
<td>1506</td>
<td>Used actual line speed value</td>
</tr>
<tr>
<td>V1.2.4</td>
<td>Torque reference</td>
<td>%</td>
<td>18</td>
<td>Includes friction and inertia compensations. In testing mode, the torque reference also includes friction compensations and inertia compensation.</td>
</tr>
<tr>
<td>V1.2.5</td>
<td>Speed Reference</td>
<td>RPM</td>
<td>1507</td>
<td>Pure speed reference from radius and line speed reference.</td>
</tr>
<tr>
<td>V1.2.6</td>
<td>Speed reference limit</td>
<td>RPM</td>
<td>1508</td>
<td>Speed reference limit which is calculated from old radius and line speed reference</td>
</tr>
<tr>
<td>V1.2.7</td>
<td>Radius Old</td>
<td>%</td>
<td>1509</td>
<td>Radius value which is used for calculating speed reference limit.</td>
</tr>
<tr>
<td>V1.2.8</td>
<td>RPM limit +</td>
<td>RPM</td>
<td>1510</td>
<td></td>
</tr>
<tr>
<td>V1.2.9</td>
<td>RPM limit -</td>
<td>RPM</td>
<td>1511</td>
<td></td>
</tr>
<tr>
<td>V1.2.10</td>
<td>Acceleration compensation</td>
<td></td>
<td>1520</td>
<td></td>
</tr>
<tr>
<td>V1.2.11</td>
<td>Tension torque</td>
<td>%</td>
<td>1515</td>
<td></td>
</tr>
<tr>
<td>V1.2.12</td>
<td>Viscous torque</td>
<td>%</td>
<td>1516</td>
<td></td>
</tr>
<tr>
<td>V1.2.13</td>
<td>Static torque</td>
<td>%</td>
<td>1517</td>
<td></td>
</tr>
<tr>
<td>V1.2.14</td>
<td>PIC torque</td>
<td>%</td>
<td>1518</td>
<td></td>
</tr>
<tr>
<td>V1.2.15</td>
<td>Motoring torque limit</td>
<td>%</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>V1.2.16</td>
<td>Release torque limit</td>
<td>%</td>
<td>1501</td>
<td></td>
</tr>
<tr>
<td>V1.2.17</td>
<td>Tension reference</td>
<td>%</td>
<td>1503</td>
<td></td>
</tr>
<tr>
<td>V1.2.18</td>
<td>Taper reference</td>
<td>%</td>
<td>1505</td>
<td></td>
</tr>
<tr>
<td>V1.2.19</td>
<td>Tension Actual</td>
<td>%</td>
<td>1638</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Winder monitoring values

**V1.2.1 Winder radius**
Radius on keypad has not been limited via minimum radius or maximum radius (100%) to confirm the correct actual and/or reference values scaling. Internally used radius is limited from minimum radius to 100,00 %.

**V1.2.2 Line speed reference**
Used line speed reference value

**V1.2.3 Line speed actual**
Used actual line speed value

**V1.2.4 Torque Reference**
Includes friction and inertia compensations. In testing mode, the torque reference also includes friction compensations and inertia compensation.

**V1.2.5 Speed Reference**
Pure speed reference from radius and line speed reference.

**V1.2.6 Speed Reference limit**
Speed reference limit which is calculated from old radius and line speed reference

**V1.2.7 Radius old**
Radius value which is used for calculating speed reference limit.
V1.2.8  **RPM Limit +**  
Positive speed limit given from application

V1.2.9  **RPM Limit –**  
Negative speed limit given from application

V1.2.10  **Acceleration compensation**  
Shows the inertia compensation to improve speed response during acceleration and deceleration. Time is defined as acceleration time to nominal speed with nominal torque.

V1.2.11  **Tension torque**  
Actual torque, which is used for tension. Part of torque reference.

V1.2.12  **Viscous torque**  
Amount of torque, which is used for viscous friction compensation. Part of torque reference.

V1.2.13  **Static torque**  
Amount of torque, which is used for static friction compensation. Part of torque reference.

V1.2.14  **PIC torque**  
When using tension feedback devices this value shown amount of used to correct tension.

V1.2.15  **Motor torque limit**  
While in rewinding this value show actually used motoring torque limit. While in unwinding this value is used also for generating torque limit.

V1.2.17  **Release torque limit**  
Torque what must be reached until operation mode changes to normal winding, if slack recovery is in use.

V1.2.17  **Tension reference**  
Tension reference, equals full scale torque (P2.12.2.3) at 100.0 % radius.

V1.2.18  **Taper reference**  
Taper tension reference, which is added to tension reference.

V1.2.19  **Tension actual**  
Shows the actual measured tension.
5.2 Basic parameters (Control keypad: Menu M2 → G2.1)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2.1.1</td>
<td>Min frequency</td>
<td>0,00</td>
<td>Par. 2.1.2</td>
<td>Hz</td>
<td>0,00</td>
<td>101</td>
<td></td>
<td>NOTE: If ( f_{\text{max}} ) &gt; than the motor synchronous speed, check suitability for motor and drive system</td>
</tr>
<tr>
<td>P2.1.2</td>
<td>Max frequency</td>
<td>Par. 2.1.1</td>
<td>320,00</td>
<td>Hz</td>
<td>50,00</td>
<td>102</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.1.3</td>
<td>Acceleration time 1</td>
<td>0,1</td>
<td>3000,0</td>
<td>s</td>
<td>3,0</td>
<td>103</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.1.4</td>
<td>Deceleration time 1</td>
<td>0,1</td>
<td>3000,0</td>
<td>s</td>
<td>3,0</td>
<td>104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.1.5</td>
<td>Current limit</td>
<td>0,1 x ( l_i )</td>
<td>2,5 x ( l_i )</td>
<td>A</td>
<td>1,5 x ( l_i )</td>
<td>107</td>
<td></td>
<td>NOTE: This applies for frequency converters up to FR7. For greater sizes, consult the factory.</td>
</tr>
<tr>
<td>P2.1.6</td>
<td>Nominal voltage of the motor</td>
<td>180</td>
<td>690</td>
<td>V</td>
<td>NX2: 230V NX5: 400V</td>
<td>110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.1.7</td>
<td>Nominal frequency of the motor</td>
<td>30,00</td>
<td>320,00</td>
<td>Hz</td>
<td>50,00</td>
<td>111</td>
<td></td>
<td>Check the rating plate of the motor</td>
</tr>
<tr>
<td>P2.1.8</td>
<td>Nominal speed of the motor</td>
<td>300</td>
<td>20 000</td>
<td>rpm</td>
<td>1440</td>
<td>112</td>
<td></td>
<td>The default applies for a 4-pole motor and a nominal size frequency converter.</td>
</tr>
<tr>
<td>P2.1.9</td>
<td>Nominal current of the motor</td>
<td>1 x ( l_i )</td>
<td>2,5 x ( l_i )</td>
<td>A</td>
<td>( l_i )</td>
<td>113</td>
<td></td>
<td>Check the rating plate of the motor</td>
</tr>
<tr>
<td>2.1.10</td>
<td>Motor cos( \phi )</td>
<td>0,30</td>
<td>1,00</td>
<td></td>
<td>0,85</td>
<td>120</td>
<td></td>
<td>Check the rating plate of the motor</td>
</tr>
<tr>
<td>2.1.11</td>
<td>I/O reference</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td></td>
<td>117</td>
<td></td>
<td>0=AI1 1=AI2 2=Keypad 3=Fieldbus</td>
</tr>
<tr>
<td>2.1.12</td>
<td>Line Speed Reference Source</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td></td>
<td>1611</td>
<td></td>
<td>0=Not Used 1=I/O Terminal 2=Keypad 3=Fieldbus</td>
</tr>
<tr>
<td>2.1.13</td>
<td>Line Tension Reference Source</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td></td>
<td>1612</td>
<td></td>
<td>0=Not Used 1=I/O Terminal 2=Keypad 3=Fieldbus</td>
</tr>
<tr>
<td>2.1.14</td>
<td>Line Speed Actual Source</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td>1613</td>
<td></td>
<td>0=Not Used 1=I/O Terminal 2=Fieldbus</td>
</tr>
<tr>
<td>2.1.15</td>
<td>Radius Actual Source</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td>1614</td>
<td></td>
<td>0=Not Used 1=I/O Terminal 2=Fieldbus</td>
</tr>
<tr>
<td>2.1.16</td>
<td>Line Tension Actual Source</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td>1615</td>
<td></td>
<td>0=Not Used 1=I/O Terminal 2=Fieldbus</td>
</tr>
<tr>
<td>2.1.17</td>
<td>Preset Radius Value Source</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td>1616</td>
<td></td>
<td>0=Not Used 1=I/O Terminal 2=Fieldbus</td>
</tr>
<tr>
<td>2.1.18</td>
<td>Taper function source</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
<td>1617</td>
<td></td>
<td>0=Not Used 1=I/O Terminal 2=Keypad 3=Fieldbus</td>
</tr>
<tr>
<td>2.1.19</td>
<td>Jogging speed reference</td>
<td>RPM</td>
<td>0</td>
<td></td>
<td></td>
<td>124</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 4: Basic parameters G2.1*
5.3 Input signals (Control keypad: Menu M2 → G2.2)

5.3.1 Basic Settings (Control keypad: Menu M2 → G2.2.1)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>DIN1</th>
<th>DIN2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.1.1</td>
<td>Start/Stop logic</td>
<td>0</td>
<td>6</td>
<td></td>
<td>0</td>
<td>300</td>
<td></td>
<td>Start fwd</td>
<td>Start rvs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Start/Stop</td>
<td>Rvs/Fwd</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Start pulse</td>
<td>Stop pulse</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fwd*</td>
<td>Rvs*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Start*/Stop</td>
<td>Run enable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Start*/Stop</td>
<td></td>
</tr>
</tbody>
</table>

2.2.1.2 Reference scaling minimum value 0,00 par. 2.2.5 Hz 0,00 303

Selects the frequency that corresponds to the min. reference signal 0,00 = No scaling

P2.2.1.3 Reference scaling maximum value 0,00 320,00 Hz 0,00 304

Selects the frequency that corresponds to the min. reference signal 0,00 = No scaling

P2.2.1.4 Reference inversion 0 1 0 0=Not inverted 1=Inverted

P2.2.1.5 Reference filter time 0,00 10,00 s 0,10 306 0 = No filtering

Table 5. Input signals, G2.2.

* = Rising edge required to start

5.3.2 Digital Inputs (Control keypad: Menu M2 → G2.2.2)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.2.1</td>
<td>Run enabled</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>407</td>
<td></td>
</tr>
<tr>
<td>2.2.2.2</td>
<td>Reverse</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>412</td>
<td></td>
</tr>
<tr>
<td>2.2.2.3</td>
<td>Fault reset</td>
<td>0</td>
<td>A.6</td>
<td></td>
<td>414</td>
<td></td>
</tr>
<tr>
<td>2.2.2.4</td>
<td>External fault (close)</td>
<td>0</td>
<td>A.3</td>
<td></td>
<td>405</td>
<td></td>
</tr>
<tr>
<td>2.2.2.5</td>
<td>External fault (open)</td>
<td>0</td>
<td>0.2</td>
<td></td>
<td>406</td>
<td></td>
</tr>
<tr>
<td>2.2.2.6</td>
<td>Acc/Dec time selection</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>408</td>
<td></td>
</tr>
<tr>
<td>2.2.2.7</td>
<td>Jogging speed</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>413</td>
<td></td>
</tr>
<tr>
<td>2.2.2.8</td>
<td>Control from I/O terminal</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>409</td>
<td></td>
</tr>
<tr>
<td>2.2.2.9</td>
<td>Control from keypad</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>410</td>
<td></td>
</tr>
<tr>
<td>2.2.2.10</td>
<td>Control from fieldbus</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>411</td>
<td></td>
</tr>
<tr>
<td>2.2.2.11</td>
<td>Winder mode</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>1610</td>
<td></td>
</tr>
<tr>
<td>2.2.2.12</td>
<td>Control mode</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>1611</td>
<td></td>
</tr>
<tr>
<td>2.2.2.13</td>
<td>Enable web break detection</td>
<td>0</td>
<td>0.2</td>
<td></td>
<td>1612</td>
<td></td>
</tr>
<tr>
<td>2.2.2.14</td>
<td>Speed release</td>
<td>0</td>
<td>0.2</td>
<td></td>
<td>1613</td>
<td></td>
</tr>
<tr>
<td>2.2.2.15</td>
<td>Reset radius</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>1614</td>
<td></td>
</tr>
<tr>
<td>2.2.2.16</td>
<td>Web break</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>1615</td>
<td></td>
</tr>
<tr>
<td>2.2.2.17</td>
<td>DC brake in stop</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>1616</td>
<td></td>
</tr>
<tr>
<td>2.2.2.18</td>
<td>Emergency Stop</td>
<td>0</td>
<td>0.2</td>
<td></td>
<td>1617</td>
<td></td>
</tr>
<tr>
<td>2.2.2.19</td>
<td>Enable PI</td>
<td>0</td>
<td>0.2</td>
<td></td>
<td>1639</td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Digital inputs, G2.2
### 5.3.3 Line Speed Reference (Control keypad: Menu M2 \(\rightarrow\) G2.2.3)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.3.1</td>
<td>Line Speed Reference signal selection</td>
<td>0</td>
<td>E.10</td>
<td>0.1</td>
<td>0</td>
<td></td>
<td>1620</td>
<td></td>
</tr>
<tr>
<td>2.2.3.2</td>
<td>Line Speed Reference filter time</td>
<td>0.00</td>
<td>10.00</td>
<td>s</td>
<td>0.01</td>
<td></td>
<td>1621</td>
<td></td>
</tr>
<tr>
<td>2.2.3.3</td>
<td>Line Speed Reference signal range</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1622</td>
<td></td>
<td>0=0—20 mA 1=4—20 mA 2=Customised</td>
<td></td>
</tr>
<tr>
<td>2.2.3.4</td>
<td>Line Speed Reference signal minimum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>0.00</td>
<td></td>
<td>1623</td>
<td></td>
</tr>
<tr>
<td>2.2.3.5</td>
<td>Line Speed Reference input maximum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>100.00</td>
<td></td>
<td>1624</td>
<td></td>
</tr>
<tr>
<td>2.2.3.6</td>
<td>Line Speed Reference signal inversion</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1625</td>
<td></td>
<td>0=Not inverted 1=Inverted</td>
<td></td>
</tr>
<tr>
<td>2.2.3.7</td>
<td>Line Speed Reference Ramp Rate</td>
<td>0</td>
<td>100</td>
<td>Hz/s</td>
<td>0</td>
<td>1</td>
<td>0=Not in use Stabilizes inertia compensation</td>
<td></td>
</tr>
</tbody>
</table>

*Table 7. Line speed reference, G2.2.3*

### 5.3.4 Line Tension Reference (Control keypad: Menu M2 \(\rightarrow\) G2.2.4)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.4.1</td>
<td>Line Tension Reference signal selection</td>
<td>0</td>
<td>E.10</td>
<td>0.1</td>
<td>0</td>
<td></td>
<td>1630</td>
<td></td>
</tr>
<tr>
<td>2.2.4.2</td>
<td>Line Tension Reference filter time</td>
<td>0.00</td>
<td>10.00</td>
<td>s</td>
<td>0.01</td>
<td></td>
<td>1631</td>
<td></td>
</tr>
<tr>
<td>2.2.4.3</td>
<td>Line Tension Reference signal range</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1632</td>
<td></td>
<td>0=0—20 mA 1=4—20 mA 2=Customised</td>
<td></td>
</tr>
<tr>
<td>2.2.4.4</td>
<td>Line Tension Reference input minimum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>0.00</td>
<td></td>
<td>1633</td>
<td></td>
</tr>
<tr>
<td>2.2.4.5</td>
<td>Line Tension Reference input maximum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>100.00</td>
<td></td>
<td>1634</td>
<td></td>
</tr>
<tr>
<td>2.2.4.6</td>
<td>Line Tension Reference signal inversion</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1635</td>
<td></td>
<td>0=Not inverted 1=Inverted</td>
<td></td>
</tr>
</tbody>
</table>

*Table 8. Tension reference, G2.2.4*
### 5.3.5 Line Speed Actual (Control keypad: Menu M2 → G2.2.5)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.5.1</td>
<td>Line Speed Actual signal selection</td>
<td>0</td>
<td>E.10</td>
<td></td>
<td>0.1</td>
<td></td>
<td>1640</td>
<td></td>
</tr>
<tr>
<td>2.2.5.2</td>
<td>Line Speed Actual filter time</td>
<td>0.00</td>
<td>10.00</td>
<td>s</td>
<td>0.01</td>
<td></td>
<td>1641</td>
<td></td>
</tr>
<tr>
<td>2.2.5.3</td>
<td>Line Speed Actual signal range</td>
<td>0</td>
<td>2</td>
<td></td>
<td>0</td>
<td></td>
<td>1642</td>
<td>0=0—20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=4—20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Customised</td>
</tr>
<tr>
<td>2.2.5.4</td>
<td>Line Speed Actual input minimum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>0.00</td>
<td></td>
<td>1643</td>
<td></td>
</tr>
<tr>
<td>2.2.5.5</td>
<td>Line Speed Actual input maximum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>100.00</td>
<td></td>
<td>1644</td>
<td></td>
</tr>
<tr>
<td>2.2.5.6</td>
<td>Line Speed Actual signal inversion</td>
<td>0</td>
<td>1</td>
<td></td>
<td>0</td>
<td></td>
<td>1645</td>
<td>0=Not inverted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=Inverted</td>
</tr>
</tbody>
</table>

Table 9. Speed actual, G2.2.5

### 5.3.6 Radius Actual (Control keypad: Menu M2 → G2.2.6)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.6.1</td>
<td>Radius Actual signal selection</td>
<td>0</td>
<td>E.10</td>
<td></td>
<td>0.1</td>
<td></td>
<td>1650</td>
<td></td>
</tr>
<tr>
<td>2.2.6.2</td>
<td>Radius Actual filter time</td>
<td>0.00</td>
<td>10.00</td>
<td>s</td>
<td>0.01</td>
<td></td>
<td>1651</td>
<td></td>
</tr>
<tr>
<td>2.2.6.3</td>
<td>Radius Actual signal range</td>
<td>0</td>
<td>2</td>
<td></td>
<td>0</td>
<td></td>
<td>1652</td>
<td>0=0—20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=4—20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Customised</td>
</tr>
<tr>
<td>2.2.6.4</td>
<td>Radius Actual input minimum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>0.00</td>
<td></td>
<td>1653</td>
<td></td>
</tr>
<tr>
<td>2.2.6.5</td>
<td>Radius Actual input maximum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>100.00</td>
<td></td>
<td>1654</td>
<td></td>
</tr>
<tr>
<td>2.2.6.6</td>
<td>Radius Actual signal inversion</td>
<td>0</td>
<td>1</td>
<td></td>
<td>0</td>
<td></td>
<td>1655</td>
<td>0=Not inverted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=Inverted</td>
</tr>
</tbody>
</table>

Table 10. Radius actual, G2.2.6

### 5.3.7 Line Tension Actual (Control keypad: Menu M2 → G2.2.7)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.7.1</td>
<td>Tension Actual signal selection</td>
<td>0</td>
<td>E.10</td>
<td></td>
<td>0.1</td>
<td></td>
<td>1660</td>
<td></td>
</tr>
<tr>
<td>2.2.7.2</td>
<td>Tension Actual filter time</td>
<td>0.00</td>
<td>10.00</td>
<td>s</td>
<td>0.01</td>
<td></td>
<td>1661</td>
<td></td>
</tr>
<tr>
<td>2.2.7.3</td>
<td>Tension Actual signal range</td>
<td>0</td>
<td>2</td>
<td></td>
<td>0</td>
<td></td>
<td>1662</td>
<td>0=0—20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=4—20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Customised</td>
</tr>
<tr>
<td>2.2.7.4</td>
<td>Tension Actual input minimum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>0.00</td>
<td></td>
<td>1663</td>
<td></td>
</tr>
<tr>
<td>2.2.7.5</td>
<td>Tension Actual input maximum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>100.00</td>
<td></td>
<td>1664</td>
<td></td>
</tr>
<tr>
<td>2.2.7.6</td>
<td>Tension Actual signal inversion</td>
<td>0</td>
<td>1</td>
<td></td>
<td>0</td>
<td></td>
<td>1665</td>
<td>0=Not inverted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=Inverted</td>
</tr>
</tbody>
</table>

Table 11. Tension actual, G2.2.7

24-hour support +358 (0)40 837 1150 • Email: vacon@vacon.com
### 5.3.8 Preset Radius (Control keypad: Menu M2 → G2.2.8)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.8.1</td>
<td>Preset Radius signal selection</td>
<td>0</td>
<td>E.10</td>
<td>0.1</td>
<td>1670</td>
<td>1671</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2.8.2</td>
<td>Preset Radius signal range</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1671</td>
<td>1671</td>
<td></td>
<td>0=0—20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=4—20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Customised</td>
</tr>
<tr>
<td>2.2.8.3</td>
<td>Preset Radius input minimum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>0.00</td>
<td></td>
<td>1672</td>
<td></td>
</tr>
<tr>
<td>2.2.8.4</td>
<td>Preset Radius input maximum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>100.00</td>
<td></td>
<td>1673</td>
<td></td>
</tr>
<tr>
<td>2.2.8.5</td>
<td>Preset Radius signal inversion</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1674</td>
<td>1674</td>
<td></td>
<td>0=Not inverted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=Inverted</td>
</tr>
</tbody>
</table>

Table 12. Preset radius, G2.2.8

### 5.3.9 Taper functions (Control keypad: Menu M2 → G2.2.9)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.9.1</td>
<td>Taper signal selection</td>
<td>0</td>
<td>E.10</td>
<td>0.1</td>
<td>1580</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2.9.2</td>
<td>Taper signal range</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1581</td>
<td></td>
<td></td>
<td>0=0—20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=4—20 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Customised</td>
</tr>
<tr>
<td>2.2.9.3</td>
<td>Taper input minimum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>1582</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2.9.4</td>
<td>Taper input maximum scaling</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>1583</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2.9.5</td>
<td>Taper signal inversion</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1584</td>
<td></td>
<td></td>
<td>0=Not inverted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1=Inverted</td>
</tr>
<tr>
<td>2.2.9.6</td>
<td>Taper minimum reference</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>1585</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2.9.7</td>
<td>Taper maximum reference</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>1586</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 13. Taper functions, G2.2.9
5.4 Output signals (Control keypad: Menu M2 → G2.3)

5.4.1 Digital outputs (Control keypad: Menu M2 → G2.3.1)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3.1.1</td>
<td>Ready</td>
<td>0</td>
<td>A.1</td>
<td></td>
<td>432</td>
<td></td>
</tr>
<tr>
<td>2.3.1.2</td>
<td>Run</td>
<td>0</td>
<td>B.1</td>
<td></td>
<td>433</td>
<td></td>
</tr>
<tr>
<td>2.3.1.3</td>
<td>Fault</td>
<td>0</td>
<td>B.2</td>
<td></td>
<td>434</td>
<td></td>
</tr>
<tr>
<td>2.3.1.4</td>
<td>Fault, inverted</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>435</td>
<td></td>
</tr>
<tr>
<td>2.3.1.5</td>
<td>Over Temperature Warn</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>439</td>
<td></td>
</tr>
<tr>
<td>2.3.1.6</td>
<td>External Fault</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>437</td>
<td></td>
</tr>
<tr>
<td>2.3.1.7</td>
<td>Reference fault/Warning</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>438</td>
<td></td>
</tr>
<tr>
<td>2.3.1.8</td>
<td>Warning</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>436</td>
<td></td>
</tr>
<tr>
<td>2.3.1.9</td>
<td>Reverse</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>440</td>
<td></td>
</tr>
<tr>
<td>2.3.1.10</td>
<td>Jogging</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>443</td>
<td></td>
</tr>
<tr>
<td>2.3.1.11</td>
<td>At reference speed</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>442</td>
<td></td>
</tr>
<tr>
<td>2.3.1.12</td>
<td>Motor regulator active</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>454</td>
<td></td>
</tr>
<tr>
<td>2.3.1.13</td>
<td>Frequency output supervision limit</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>447</td>
<td>See G 2.3.4</td>
</tr>
<tr>
<td>2.3.1.14</td>
<td>External control place</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>444</td>
<td></td>
</tr>
<tr>
<td>2.3.1.15</td>
<td>Motor thermal protection</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>452</td>
<td></td>
</tr>
<tr>
<td>2.3.1.16</td>
<td>FB Digital input 1</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>455</td>
<td></td>
</tr>
<tr>
<td>2.3.1.17</td>
<td>Slack recovery ON</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>1690</td>
<td></td>
</tr>
<tr>
<td>2.3.1.18</td>
<td>Slack recovery OFF</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>1691</td>
<td></td>
</tr>
<tr>
<td>2.3.1.19</td>
<td>Web Break fault or warning</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>1692</td>
<td></td>
</tr>
<tr>
<td>2.3.1.20</td>
<td>Brake control</td>
<td>0</td>
<td>0.1</td>
<td></td>
<td>1693</td>
<td></td>
</tr>
</tbody>
</table>

*Table 14. Digital outputs, G2.3.1*

**WARNING** Be ABSOLUTELY sure not to connect two functions to one and same output in order to avoid function overruns and to ensure flawless operation.
### 5.4.2 Analogue output 1 (Control keypad: Menu M2 → G2.3.2)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2.3.3.1</td>
<td>Analogue output 1 signal selection</td>
<td>0</td>
<td>E.10</td>
<td>0.1</td>
<td>464</td>
<td></td>
<td></td>
<td>TTF programming method used. See PFC application.</td>
</tr>
<tr>
<td>P2.3.2.1</td>
<td>Analogue output function</td>
<td>0</td>
<td>8</td>
<td>1</td>
<td>307</td>
<td></td>
<td></td>
<td>1=Output freq. (0—f&lt;sub&gt;max&lt;/sub&gt;)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2=Freq. reference (0—f&lt;sub&gt;max&lt;/sub&gt;)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3=Motor speed (0—Motor nominal speed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4=Output current (0—i&lt;sub&gt;Motor&lt;/sub&gt;)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5=Motor torque (0—T&lt;sub&gt;Motor&lt;/sub&gt;)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6=Motor power (0—P&lt;sub&gt;Motor&lt;/sub&gt;)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7=Motor voltage (0—U&lt;sub&gt;Motor&lt;/sub&gt;)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8=DC-link volt (0—1000V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9=Line speed</td>
</tr>
</tbody>
</table>

### Table 15. Analogue output 1, G2.3.2

### 5.4.3 Analogue output 2 (Control keypad: Menu M2 → G2.3.3)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2.3.3.1</td>
<td>Analogue output 2 signal selection</td>
<td>0</td>
<td>8</td>
<td>4</td>
<td>472</td>
<td></td>
<td></td>
<td>As parameter 2.3.2.1</td>
</tr>
<tr>
<td>P2.3.3.2</td>
<td>Analogue output 2 function</td>
<td>0</td>
<td>10,00</td>
<td>s</td>
<td>1,00</td>
<td>473</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.3.3.3</td>
<td>Analogue output 2 filter time</td>
<td>0</td>
<td>10,00</td>
<td>s</td>
<td>1,00</td>
<td>474</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.3.3.4</td>
<td>Analogue output 2 inversion</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>475</td>
<td></td>
<td></td>
<td>0 = Not inverted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 = Inverted</td>
</tr>
<tr>
<td>P2.3.3.5</td>
<td>Analogue output 2 minimum</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>476</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0 = 0 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 = 4 mA</td>
</tr>
</tbody>
</table>

### Table 16. Analogue output 2, G2.3.3

### 5.4.4 Limit settings (Control keypad: Menu M2 → G2.3.4)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2.3.4.1</td>
<td>Output frequency limit 1 supervision</td>
<td>0</td>
<td>1</td>
<td>%</td>
<td>0</td>
<td>475</td>
<td></td>
<td>0 = No limit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 = Low limit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 = High limit</td>
</tr>
<tr>
<td>P2.3.4.2</td>
<td>Output frequency limit 1; supervision value</td>
<td>10</td>
<td>1000</td>
<td>%</td>
<td>1000</td>
<td>476</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 17. Limits, G2.3.4
### 5.5 Drive control parameters (Control keypad: Menu M2 → G2.4)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2.4.1</td>
<td>Ramp 1 shape</td>
<td>0,0</td>
<td>100%</td>
<td>%</td>
<td>0,0</td>
<td>500</td>
<td></td>
<td>0 = Linear&lt;br&gt;&gt;0 = S-curve ramp time</td>
</tr>
<tr>
<td>P2.4.2</td>
<td>Ramp 2 shape</td>
<td>0,0</td>
<td>100%</td>
<td>%</td>
<td>0,0</td>
<td>501</td>
<td></td>
<td>0 = Linear&lt;br&gt;&gt;0 = S-curve ramp time</td>
</tr>
<tr>
<td>P2.4.3</td>
<td>Acceleration time 2</td>
<td>0,1</td>
<td>3000,0</td>
<td>s</td>
<td>10,0</td>
<td>502</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.4.4</td>
<td>Deceleration time 2</td>
<td>0,1</td>
<td>3000,0</td>
<td>s</td>
<td>10,0</td>
<td>503</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brake chopper</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>504</td>
<td></td>
<td>0 = Disabled&lt;br&gt;1 = Used and tested in Run state&lt;br&gt;2 = External brake&lt;br&gt;chopper&lt;br&gt;3 = Used and tested in Ready state</td>
</tr>
<tr>
<td>P2.4.6</td>
<td>Start function</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>505</td>
<td></td>
<td>0 = Ramp&lt;br&gt;1 = Flying start</td>
</tr>
<tr>
<td>P2.4.7</td>
<td>Stop function</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>506</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.4.8</td>
<td>DC braking current</td>
<td>0,15 x I_n</td>
<td>1,5 x I_n</td>
<td>A</td>
<td>Varies</td>
<td>507</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.4.9</td>
<td>DC braking time at stop</td>
<td>0,00</td>
<td>600,00</td>
<td>s</td>
<td>0,00</td>
<td>508</td>
<td></td>
<td>0 = DC brake is off at stop</td>
</tr>
<tr>
<td>P2.4.10</td>
<td>Frequency to start DC braking during ramp stop</td>
<td>0,10</td>
<td>10,00</td>
<td>Hz</td>
<td>0,00</td>
<td>515</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.4.11</td>
<td>DC braking time at start</td>
<td>0,00</td>
<td>600,00</td>
<td>s</td>
<td>0,00</td>
<td>516</td>
<td></td>
<td>0 = DC brake is off at start</td>
</tr>
<tr>
<td>P2.4.12</td>
<td>Flux brake</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>520</td>
<td></td>
<td>0 = Off&lt;br&gt;1 = On</td>
</tr>
<tr>
<td>P2.4.13</td>
<td>Flux braking current</td>
<td>0,0</td>
<td>Varies</td>
<td>A</td>
<td>0,00</td>
<td>519</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.4.14</td>
<td>Zero speed level</td>
<td>0,0</td>
<td>1500</td>
<td>RPM</td>
<td>0,00</td>
<td>1700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.4.15</td>
<td>Monitored Speed</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1701</td>
<td></td>
<td>0 = Reference&lt;br&gt;1 = Actual</td>
</tr>
</tbody>
</table>

Table 18. Drive control parameters, G2.4

### 5.6 Prohibit frequency parameters (Control keypad: Menu M2 → G2.5)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2.5.1</td>
<td>Prohibit frequency range 1 low limit</td>
<td>0,00</td>
<td>par. 2.5.2</td>
<td>Hz</td>
<td>0,00</td>
<td>509</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.5.2</td>
<td>Prohibit frequency range 1 high limit</td>
<td>0,00</td>
<td>320,00</td>
<td>Hz</td>
<td>0,0</td>
<td>510</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.5.3</td>
<td>Prohibit acc./dec. ramp</td>
<td>0,1</td>
<td>10,0</td>
<td>1,0</td>
<td>518</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 19. Prohibit frequency parameters, G2.5
5.7 Motor control parameters (Control keypad: Menu M2 → G2.6)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2.6.1</td>
<td>Motor control mode</td>
<td>0</td>
<td>NXS</td>
<td>0</td>
<td>0</td>
<td>600</td>
<td></td>
<td>0=Open loop 1=Closed loop</td>
</tr>
<tr>
<td>P2.6.2</td>
<td>U/f optimisation</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>109</td>
<td></td>
<td></td>
<td>0=Not used 1=Automatic torque boost</td>
</tr>
<tr>
<td>P2.6.3</td>
<td>U/f ratio selection</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>108</td>
<td></td>
<td></td>
<td>0=Linear 1=Squared 2=Programmable 3=Linear with flux optim.</td>
</tr>
<tr>
<td>P2.6.4</td>
<td>Field weakening point</td>
<td>30,00</td>
<td>320,00</td>
<td>Hz</td>
<td>50,00</td>
<td>602</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.5</td>
<td>Voltage at field weakening point</td>
<td>10,00</td>
<td>200,00</td>
<td>%</td>
<td>100,00</td>
<td>603</td>
<td></td>
<td>n% x U_{\text{nom}} Parameter max. value = par. 2.6.7</td>
</tr>
<tr>
<td>P2.6.6</td>
<td>U/f curve midpoint frequency</td>
<td>0,0</td>
<td>par.</td>
<td>P2.6.4</td>
<td>50,00</td>
<td>604</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.7</td>
<td>U/f curve midpoint voltage</td>
<td>0,0</td>
<td>100,00</td>
<td>%</td>
<td>100,00</td>
<td>605</td>
<td></td>
<td>n% x U_{\text{nom}}</td>
</tr>
<tr>
<td>P2.6.8</td>
<td>Output voltage at zero frequency</td>
<td>0,0</td>
<td>40,00</td>
<td>%</td>
<td>0,0</td>
<td>606</td>
<td></td>
<td>n% x U_{\text{nom}}</td>
</tr>
<tr>
<td>P2.6.9</td>
<td>Switching frequency</td>
<td>1,0</td>
<td>16,0</td>
<td>kHz</td>
<td>Varies</td>
<td>601</td>
<td></td>
<td>Depends on kW</td>
</tr>
<tr>
<td>P2.6.10</td>
<td>Overvoltage controller</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>607</td>
<td></td>
<td></td>
<td>0=Not used 1=Yes: No Ramping 1=Yes: Ramping</td>
</tr>
<tr>
<td>P2.6.11</td>
<td>Undervoltage controller</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>608</td>
<td></td>
<td></td>
<td>0=Not used 1=Used 2=Ramping down</td>
</tr>
<tr>
<td>P2.6.12</td>
<td>Speed Limit Pos</td>
<td>-10000</td>
<td>10000</td>
<td>1500</td>
<td>1702</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.13</td>
<td>Speed Limit Neg</td>
<td>-10000</td>
<td>10000</td>
<td>0</td>
<td>1703</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.14</td>
<td>Motoring Torque Limit</td>
<td>0.0</td>
<td>300.0</td>
<td>%</td>
<td>300.0</td>
<td>1717</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.15</td>
<td>Generating Torque Limit</td>
<td>0.0</td>
<td>300.0</td>
<td>%</td>
<td>300.0</td>
<td>1704</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.16</td>
<td>Load drooping</td>
<td>0,0</td>
<td>100.0</td>
<td>%</td>
<td>0,0</td>
<td>620</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.17</td>
<td>Identification</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>631</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Closed Loop parameter group 2.6.15 (NXP only)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2.6.15.1</td>
<td>Magnetizing current</td>
<td>0.0</td>
<td>100.0</td>
<td>A</td>
<td>0.00</td>
<td>612</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.15.2</td>
<td>Speed control Kp</td>
<td>0</td>
<td>1000</td>
<td></td>
<td>30</td>
<td>613</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.15.3</td>
<td>Speed control Ti</td>
<td>0.0</td>
<td>500.0</td>
<td>ms</td>
<td>30.0</td>
<td>614</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.15.4</td>
<td>Acceleration Compensation</td>
<td>0.0</td>
<td>300.0</td>
<td>S</td>
<td>0.00</td>
<td>626</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.15.5</td>
<td>Slip adjust</td>
<td>0</td>
<td>500</td>
<td>%</td>
<td>100</td>
<td>619</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.15.6</td>
<td>Start magnetizing current</td>
<td>0</td>
<td>Varies</td>
<td>s</td>
<td>Varies</td>
<td>627</td>
<td></td>
<td>Use motor nominal current</td>
</tr>
<tr>
<td>P2.6.15.7</td>
<td>Start magnetizing time</td>
<td>0</td>
<td>32.000</td>
<td></td>
<td>0</td>
<td>628</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.15.8</td>
<td>Start zero speed time</td>
<td>0</td>
<td>32000</td>
<td>ms</td>
<td>100</td>
<td>615</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.6.15.9</td>
<td>Stop zero speed time</td>
<td>0</td>
<td>32000</td>
<td>ms</td>
<td>100</td>
<td>616</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Parameter</td>
<td>Min</td>
<td>Max</td>
<td>Unit</td>
<td>Default</td>
<td>Cust</td>
<td>ID</td>
<td>Note</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
<td>---------</td>
<td>------</td>
<td>----</td>
<td>----------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| P2.6.15.10 | Start up Torque reference select         | 0   | 1   |      | 0       |      | 621| 0 = Not used  
|            |                                          |     |     |      |         |      |    | 1 = Torque memory  
|            |                                          |     |     |      |         |      |    | 2 = Torque reference  
|            |                                          |     |     |      |         |      |    | 3 = StartUp Torque FOR/REW                                            |
| P2.6.15.11 | Start up torque forward                  | -300.0 | 300.0 | %    | 0.0     |      | 633|                                                                      |
| P2.6.15.12 | Start up torque reverse                  | -300.0 | 300.0 | %    | 0.0     |      | 634|                                                                      |
| P2.6.15.13 | Encoder 1 faltering time                 | 0   | 1000 | ms   | 0       |      | 618|                                                                      |
| P2.6.15.14 | Current control Kp                       | 0.00 | 100.0 | %    | 40.00   |      | 617|                                                                      |

Table 20. Motor control parameters, G2.6
## 5.8 Protections (Control keypad: Menu M2 → G2.7)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2.7.1</td>
<td>Monitored signal</td>
<td>0</td>
<td>E.10</td>
<td>0.1</td>
<td>1705</td>
<td></td>
<td></td>
<td>Select desired signal to be monitored for 4 mA fault.</td>
</tr>
<tr>
<td>P2.7.2</td>
<td>Response to reference fault</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>700</td>
<td></td>
<td></td>
<td>0=No response 1=Warning 2=Warning+Old Freq. 3=Warning+PresetFreq 2.7.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4=Fault, stop acc. to 2.4.7 5=Fault, stop by coasting</td>
</tr>
<tr>
<td>P2.7.3</td>
<td>Reference fault frequency</td>
<td>0.00</td>
<td>Par. 2.1.2</td>
<td>Hz</td>
<td>0.00</td>
<td>728</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.4</td>
<td>Response to external fault</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>701</td>
<td></td>
<td></td>
<td>0=No response 1=Warning 2=Fault, stop acc. to 2.4.7 3=Fault, stop by coasting</td>
</tr>
<tr>
<td>P2.7.5</td>
<td>Input phase supervision</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>730</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.6</td>
<td>Response to undervoltage fault</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>727</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.7</td>
<td>Output phase supervision</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>702</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.8</td>
<td>Earth fault protection</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>703</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.9</td>
<td>Thermal protection of the motor</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>704</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.10</td>
<td>Motor ambient temperature factor</td>
<td>-100,0</td>
<td>100,0</td>
<td>%</td>
<td>0,0</td>
<td>705</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.11</td>
<td>Motor cooling factor at zero speed</td>
<td>0,0</td>
<td>150,0</td>
<td>%</td>
<td>40,0</td>
<td>706</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.12</td>
<td>Motor thermal time constant</td>
<td>1</td>
<td>200</td>
<td>min</td>
<td>10</td>
<td>707</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.13</td>
<td>Motor duty cycle</td>
<td>0</td>
<td>100</td>
<td>%</td>
<td>100</td>
<td>708</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.14</td>
<td>Stall protection</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>709</td>
<td>710</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.15</td>
<td>Stall current</td>
<td>0.1</td>
<td>6000,0</td>
<td>A</td>
<td>10,0</td>
<td>711</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.16</td>
<td>Stall time limit</td>
<td>1,00</td>
<td>120,00</td>
<td>s</td>
<td>15,00</td>
<td>712</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.17</td>
<td>Stall frequency limit</td>
<td>1,0</td>
<td>Par. 2.1.2</td>
<td>Hz</td>
<td>25,0</td>
<td>713</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.18</td>
<td>Underload protection</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>714</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.19</td>
<td>Underload curve at nominal frequency</td>
<td>10</td>
<td>150</td>
<td>%</td>
<td>50</td>
<td>715</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.20</td>
<td>Underload curve at zero frequency</td>
<td>5,0</td>
<td>150,0</td>
<td>%</td>
<td>10,0</td>
<td>716</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.21</td>
<td>Underload protection time limit</td>
<td>2</td>
<td>600</td>
<td>s</td>
<td>20</td>
<td>717</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.22</td>
<td>Response to thermistor fault</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>732</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.23</td>
<td>Response to fieldbus fault</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>733</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.24</td>
<td>Response to slot fault</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>734</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.25</td>
<td>Fieldbus watchdog delay</td>
<td>0.00</td>
<td>10.00</td>
<td></td>
<td>0.00</td>
<td>1706</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.7.26</td>
<td>Brake operation is system fault</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1707</td>
<td></td>
<td></td>
<td>0 = Close 1 = leave open</td>
</tr>
<tr>
<td>P2.7.27</td>
<td>PT-100 Numbers</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>739</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Parameter</td>
<td>Min</td>
<td>Max</td>
<td>Unit</td>
<td>Default</td>
<td>Cust</td>
<td>ID</td>
<td>Note</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
<td>---------</td>
<td>------</td>
<td>-----</td>
<td>-------</td>
</tr>
<tr>
<td>P2.7.28</td>
<td>PT-100 Fault response</td>
<td>0</td>
<td>3</td>
<td></td>
<td>0</td>
<td></td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>P2.7.29</td>
<td>PT-100 Warning limit</td>
<td>-30</td>
<td>200</td>
<td>C</td>
<td>120</td>
<td></td>
<td>741</td>
<td></td>
</tr>
<tr>
<td>P2.7.30</td>
<td>PT-100 Fault limit</td>
<td>-30</td>
<td>200</td>
<td>C</td>
<td>130</td>
<td></td>
<td>742</td>
<td></td>
</tr>
<tr>
<td>P2.7.31</td>
<td>Emergency stop mode</td>
<td>0</td>
<td>2</td>
<td></td>
<td>0</td>
<td></td>
<td>1708</td>
<td></td>
</tr>
<tr>
<td>P2.7.32</td>
<td>Emergency stop ramp time</td>
<td>0</td>
<td>3200</td>
<td>S</td>
<td>6</td>
<td></td>
<td>1709</td>
<td></td>
</tr>
</tbody>
</table>

Table 21. Protections, G2.7
5.9 Auto restart parameters (Control keypad: Menu M2 → G2.8)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2.8.1</td>
<td>Wait time</td>
<td>0,10</td>
<td>10,00</td>
<td>s</td>
<td>0,50</td>
<td>717</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.8.2</td>
<td>Trial time</td>
<td>0,00</td>
<td>60,00</td>
<td>s</td>
<td>30,00</td>
<td>718</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.8.3</td>
<td>Start function</td>
<td>0</td>
<td>2</td>
<td></td>
<td>0</td>
<td>719</td>
<td></td>
<td>0=Ramp \n 1=Flying start \n 2=According to par. 2.4.6</td>
</tr>
<tr>
<td>P2.8.4</td>
<td>Number of tries after undervoltage trip</td>
<td>0</td>
<td>10</td>
<td></td>
<td>0</td>
<td>720</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.8.5</td>
<td>Number of tries after overvoltage trip</td>
<td>0</td>
<td>10</td>
<td></td>
<td>0</td>
<td>721</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.8.6</td>
<td>Number of tries after overcurrent trip</td>
<td>0</td>
<td>3</td>
<td></td>
<td>0</td>
<td>722</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.8.7</td>
<td>Number of tries after reference trip</td>
<td>0</td>
<td>10</td>
<td></td>
<td>0</td>
<td>723</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.8.8</td>
<td>Number of tries after motor temperature fault trip</td>
<td>0</td>
<td>10</td>
<td></td>
<td>0</td>
<td>726</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2.8.9</td>
<td>Number of tries after external fault trip</td>
<td>0</td>
<td>10</td>
<td></td>
<td>0</td>
<td>725</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 22. Autorestart parameters, G2.8

5.10 Winder parameters (Control keypad: Menu M2 → G2.12)

5.10.1 Basic settings (Control keypad: Menu M2 → G2.12.1)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.9.1.1</td>
<td>Minimum radius</td>
<td>0.00</td>
<td>100.00</td>
<td>%</td>
<td>25.00</td>
<td>1710</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.9.1.2</td>
<td>Winder mode</td>
<td>0</td>
<td>1</td>
<td></td>
<td>0</td>
<td>1711</td>
<td></td>
<td>0 = Rewinder \n 1 = Unwinder</td>
</tr>
<tr>
<td>2.9.1.3</td>
<td>Control Mode</td>
<td>0</td>
<td>1</td>
<td></td>
<td>0</td>
<td>1712</td>
<td></td>
<td>0 = Seed control \n 1 = Tension control</td>
</tr>
<tr>
<td>2.9.1.4</td>
<td>Radius filtering time</td>
<td>0.00</td>
<td>320.00</td>
<td>s</td>
<td>0.03</td>
<td>1713</td>
<td></td>
<td>Filtering time for calculated radius</td>
</tr>
<tr>
<td>2.9.1.5</td>
<td>Radius ramping rate</td>
<td>0</td>
<td>10</td>
<td>%/s</td>
<td>1</td>
<td>1714</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.9.1.6</td>
<td>Radius holding level</td>
<td>0.00</td>
<td>100.00</td>
<td>%</td>
<td></td>
<td>1715</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.9.1.7</td>
<td>Radius resetting mode</td>
<td>0</td>
<td>3</td>
<td></td>
<td>1</td>
<td>1716</td>
<td></td>
<td>0 = On command \n 1 = On Start \n 2 = Command, preset \n 3 = Start, preset</td>
</tr>
<tr>
<td>2.9.1.8</td>
<td>Preset radius</td>
<td>0.00</td>
<td>100.00</td>
<td>%</td>
<td>50.00</td>
<td>1719</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.9.1.9</td>
<td>RPM Add Limit</td>
<td>0</td>
<td>500</td>
<td>RPM</td>
<td>200</td>
<td>1720</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.9.1.10</td>
<td>Speed limited by radius</td>
<td>0</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1721</td>
<td></td>
<td>Web break is monitored but frequency limit is maximum frequency</td>
</tr>
<tr>
<td>2.9.11</td>
<td>Test mode</td>
<td>0</td>
<td>3</td>
<td></td>
<td>0</td>
<td>1722</td>
<td></td>
<td>0 = Normal winder operation \n 1 = OL Freq Test \n 2 = OL CL Test \n 3 = Direct Ref</td>
</tr>
</tbody>
</table>

Table 23. Winder basic settings, G2.12.1
### 5.10.2 Tension control (Control keypad: Menu M2 → G2.12.2)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.12.2.1</td>
<td>Static Friction</td>
<td>0</td>
<td>25.0</td>
<td>%</td>
<td>0</td>
<td>1730</td>
<td></td>
<td>% of motor torque</td>
</tr>
<tr>
<td>2.12.2.2</td>
<td>Viscous friction</td>
<td>0</td>
<td>25.0</td>
<td>%</td>
<td>0</td>
<td>1731</td>
<td></td>
<td>% of motor torque</td>
</tr>
<tr>
<td>2.12.2.3</td>
<td>Full scale torque</td>
<td>0</td>
<td>150.0</td>
<td>%</td>
<td>0.0</td>
<td>1732</td>
<td></td>
<td>% of motor torque</td>
</tr>
<tr>
<td>2.12.2.4</td>
<td>Empty inertia</td>
<td>0</td>
<td>3200.0</td>
<td>%</td>
<td>0.0%</td>
<td>1733</td>
<td></td>
<td>% of motor torque</td>
</tr>
<tr>
<td>2.12.2.5</td>
<td>Full inertia</td>
<td>0</td>
<td>3200.0</td>
<td>%</td>
<td>0.0%</td>
<td>1734</td>
<td></td>
<td>% of motor torque</td>
</tr>
<tr>
<td>2.12.2.6</td>
<td>Taper radius</td>
<td>0.00</td>
<td>100.00</td>
<td>%</td>
<td>100.00</td>
<td>1735</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.12.2.7</td>
<td>Taper reference</td>
<td>-320.00</td>
<td>320.00</td>
<td>%</td>
<td>0.00</td>
<td>1736</td>
<td></td>
<td>% of motor torque</td>
</tr>
</tbody>
</table>

Table 24. Winder tension control, G2.12.2

### 5.10.3 Tension PI control (Control keypad: Menu M2 → G2.12.3)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.12.3.1</td>
<td>Tension Kp</td>
<td>-1000.0</td>
<td>1000.0</td>
<td>%</td>
<td>5.0</td>
<td>1750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.12.3.2</td>
<td>Tension Ti</td>
<td>0.00</td>
<td>60.00</td>
<td>s</td>
<td>1.00</td>
<td>1751</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.12.3.3</td>
<td>PI maximum correction</td>
<td>-100.0</td>
<td>100.00</td>
<td>%</td>
<td>10.0</td>
<td>1755</td>
<td>Related to basic reference.</td>
<td></td>
</tr>
</tbody>
</table>

Table 25. Winder tension PI control, G2.12.3

### 5.10.4 Slack recovery (Control keypad: Menu M2 → G2.12.4)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.12.4.1</td>
<td>Slack recovery reference</td>
<td>0</td>
<td>1500</td>
<td>RPM</td>
<td>30</td>
<td>1760</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.12.4.2</td>
<td>Speed releasing Acceleration time</td>
<td>0.00</td>
<td>300.0</td>
<td>s</td>
<td>0.0</td>
<td>1761</td>
<td>Acc/Dec time have priority</td>
<td></td>
</tr>
<tr>
<td>2.12.4.3</td>
<td>Minimum time at slack frequency</td>
<td>0</td>
<td>60.00</td>
<td>s</td>
<td>0.0</td>
<td>1762</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.12.4.4</td>
<td>Speed release torque limit</td>
<td>0</td>
<td>100.0</td>
<td>%</td>
<td>0.0</td>
<td>1763</td>
<td>Work as tension limit if P2.12.2.5 is greater than zero</td>
<td></td>
</tr>
</tbody>
</table>

Table 26. Winder slack recovery, G2.12.4

### 5.10.5 Winder fault handling (Control keypad: Menu M2 → G2.12.5)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.12.5.1</td>
<td>Web break response</td>
<td>0</td>
<td>2</td>
<td>%</td>
<td>0</td>
<td>1770</td>
<td>0 = No action</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 = Warning</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 = Fault</td>
<td></td>
</tr>
<tr>
<td>2.12.5.2</td>
<td>Rewinder stop mode</td>
<td>0</td>
<td>2</td>
<td>%</td>
<td>0</td>
<td>1771</td>
<td>0 = Coasting</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 = System default</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 = Rampaging</td>
<td></td>
</tr>
<tr>
<td>2.12.5.3</td>
<td>Unwinder stop mode</td>
<td>0</td>
<td>2</td>
<td>%</td>
<td>0</td>
<td>1772</td>
<td>0 = Coasting</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 = System default</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 = Rampaging</td>
<td></td>
</tr>
<tr>
<td>2.12.5.4</td>
<td>Time to web break response</td>
<td>0</td>
<td>320.0</td>
<td>s</td>
<td>0.0</td>
<td>1773</td>
<td>0.0 = Not in use</td>
<td></td>
</tr>
<tr>
<td>2.12.5.5</td>
<td>Actual line speed fault limit</td>
<td>-100.0</td>
<td>100.00</td>
<td>%</td>
<td>0.0</td>
<td>1775</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 27. Winder fault handling, G2.12.5

24-hour support +358 (0)40 837 1150 • Email: vacon@vacon.com
5.11 Fieldbus parameters (Control Keypad: Menu M2 → G2.13)

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2.13.1</td>
<td>Fieldbus data out 1 selection</td>
<td>0</td>
<td>10000</td>
<td></td>
<td>1</td>
<td></td>
<td>852</td>
<td>Choose monitoring data with parameter ID</td>
</tr>
<tr>
<td>P2.13.2</td>
<td>Fieldbus data out 2 selection</td>
<td>0</td>
<td>10000</td>
<td></td>
<td>2</td>
<td></td>
<td>853</td>
<td>Choose monitoring data with parameter ID</td>
</tr>
<tr>
<td>P2.13.3</td>
<td>Fieldbus data out 3 selection</td>
<td>0</td>
<td>10000</td>
<td></td>
<td>3</td>
<td></td>
<td>854</td>
<td>Choose monitoring data with parameter ID</td>
</tr>
<tr>
<td>P2.13.4</td>
<td>Fieldbus data out 4 selection</td>
<td>0</td>
<td>10000</td>
<td></td>
<td>4</td>
<td></td>
<td>855</td>
<td>Choose monitoring data with parameter ID</td>
</tr>
<tr>
<td>P2.13.5</td>
<td>Fieldbus data out 5 selection</td>
<td>0</td>
<td>10000</td>
<td></td>
<td>5</td>
<td></td>
<td>856</td>
<td>Choose monitoring data with parameter ID</td>
</tr>
<tr>
<td>P2.13.6</td>
<td>Fieldbus data out 6 selection</td>
<td>0</td>
<td>10000</td>
<td></td>
<td>6</td>
<td></td>
<td>857</td>
<td>Choose monitoring data with parameter ID</td>
</tr>
<tr>
<td>P2.13.7</td>
<td>Fieldbus data out 7 selection</td>
<td>0</td>
<td>10000</td>
<td></td>
<td>7</td>
<td></td>
<td>858</td>
<td>Choose monitoring data with parameter ID</td>
</tr>
<tr>
<td>P2.13.8</td>
<td>Fieldbus data out 8 selection</td>
<td>0</td>
<td>10000</td>
<td></td>
<td>37</td>
<td></td>
<td>859</td>
<td>Choose monitoring data with parameter ID</td>
</tr>
</tbody>
</table>

Table 28. Fieldbus parameters

5.12 Keypad control (Control keypad: Menu M3)

The parameters for the selection of control place and direction on the keypad are listed below. See the Keypad control menu in the Vacon NX User’s Manual.

<table>
<thead>
<tr>
<th>Code</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
<th>Default</th>
<th>Cust</th>
<th>ID</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>P3.1</td>
<td>Control place</td>
<td>1</td>
<td>3</td>
<td></td>
<td>1</td>
<td></td>
<td>125</td>
<td>0 = I/O terminal 1 = Keypad 2 = Fieldbus</td>
</tr>
<tr>
<td>R3.2</td>
<td>Keypad reference</td>
<td>Par.</td>
<td>Par.</td>
<td>Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R3.3</td>
<td>Line speed reference</td>
<td>0.00</td>
<td>100.00</td>
<td>%</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R3.4</td>
<td>Line tension reference</td>
<td>0.00</td>
<td>100.00</td>
<td>%</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P3.5</td>
<td>Direction (on keypad)</td>
<td>0</td>
<td>1</td>
<td></td>
<td>0</td>
<td></td>
<td>123</td>
<td>0 = Forward 1 = Reverse</td>
</tr>
<tr>
<td>R3.6</td>
<td>Stop button</td>
<td>0</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td>114</td>
<td>0=Limited function of Stop button 1=Stop button always enabled</td>
</tr>
</tbody>
</table>

Table 29. Keypad control parameters, M3

5.13 System menu (Control keypad: M6)

For parameters and functions related to the general use of the frequency converter, such as application and language selection, customised parameter sets or information about the hardware and software, see Chapter 7.3.6 in the Vacon NX User’s Manual.

5.14 Expander boards (Control keypad: Menu M7)

The M7 menu shows the expander and option boards attached to the control board and board-related information. For more information, see Chapter 7.3.7 in the Vacon NX User’s Manual.
6. **DESCRIPTION OF PARAMETERS**

6.1 **Basic parameters**

2.1.1 *Minimum frequency*

Minimum frequency in the Winder application determines the acceleration and deceleration times scaling. The maximum value for the parameter is 320 Hz.

2.1.2 *Maximum frequency*

Defines the maximum frequency of the frequency converter. The maximum value for the parameter is 320 Hz.

Maximum frequency is the output frequency at minimum radius with maximum line speed. Use formula below to calculate maximum frequency

\[
f_{\text{max}} = \frac{v_{\text{max}} p G r}{r_{\min} 2\pi} \quad [1]
\]

\(v_{\text{max}} = [\text{m/s}], p = \text{polepair number}, G_r = \text{Gear ratio}, r_{\min} = [\text{m}], 2\pi \approx 6.283185\)

2.1.3, 2.1.4 *Acceleration time 1, deceleration time 1*

These limits correspond to the time required for the output frequency to accelerate from the zero frequency to the set maximum frequency (par. 2.1.2).

2.1.5 *Current limit*

This parameter determines the maximum motor current from the frequency converter. To avoid motor overload, set this parameter according to the rated current of the motor. The current limit is 1.5 times the rated current (I_H) by default. In order to achieve a have good inertia compensation, you may have to use higher current limit in the Winder application.

2.1.6 *Nominal voltage of the motor*

Find this value \(U_n\) on the rating plate of the motor. This parameter sets the voltage at the field weakening point (parameter 2.6.5) to 100% \(\times U_{nmotor}\).

2.1.7 *Nominal frequency of the motor*

Find this value \(f_n\) on the rating plate of the motor. This parameter sets the field weakening point (parameter 2.6.4) to the same value.

2.1.8 *Nominal speed of the motor*

Find this value \(n_n\) on the rating plate of the motor.

2.1.9 *Nominal current of the motor*

Find this value \(I_n\) on the rating plate of the motor.
2.1.10 **Motor cos phi**
Find this value “cos phi” on the rating plate of the motor.

2.1.11 **Test mode I/O frequency reference selection**
Defines which frequency reference source is selected when controlled from the I/O control place. Default value is 0. This reference is used only during test run (Test mode = 1 & 2).

0 = Analogue voltage reference from terminals 2—3, e.g. potentiometer
1 = Analogue current reference from terminals 4—5, e.g. transducer
2 = Keypad reference from the Reference Page (Group M3)
3 = Reference from the fieldbus

2.1.12 **Motor nominal power**
Find this value $P_N$ on the rating plate of the motor. Needed when using tension control with inertia compensation. Defines the value for base inertia (V1.2.21).

2.1.13 **Line speed reference source**
2.1.14 **Line tension reference source**
2.1.18 **Preset radius source**
2.1.19 **Taper reference source**

0 = Not in use
1 = I/O
2 = Keypad
3 = Reference from the fieldbus

2.1.15 **Line speed actual source**
2.1.16 **Radius actual source**
2.1.17 **Line tension actual source**

0 = Not in use
1 = I/O
2 = Reference from the fieldbus

2.1.20 **Jogging speed reference**
This parameter defines the jogging speed for the drive. The jogging speed can be activated by connecting parameter 2.2.2.7 to any of the digital inputs available. When jogging speed is activated drive internally changes control mode to speed and frequency reference to jogging speed.
6.2 Input signals

6.2.1 Basic Settings

2.2.1.1 Start/Stop logic selection

0 DIN1: closed contact = start forward
DIN2: closed contact = start reverse

1 DIN1: closed contact = start open contact = stop
DIN2: closed contact = reverse open contact = forward

See Figure 5 below.

Figure 4. Start forward/Start reverse

1. The first selected direction has the highest priority.
2. When the DIN1 contact opens the direction of rotation starts the change.
3. If Start forward (DIN1) and Start reverse (DIN2) signals are active simultaneously the Start forward signal (DIN1) has priority.

Figure 5. Start, Stop, Reverse
2  DIN1: closed contact = start open contact = stop
DIN2: closed contact = start enabled open contact = start disabled and drive stopped if running

3  3-wire connection (pulse control):
DIN1: closed contact = start pulse
DIN2: open contact = stop pulse
(DIN3 can be programmed for reverse command)
See Figure 6.

<table>
<thead>
<tr>
<th>FWD</th>
<th>Output frequency</th>
<th>Stop function (par 2.4.7) = coasting</th>
<th>If Start and Stop pulses are simultaneous the Stop pulse overrides the Start pulse</th>
</tr>
</thead>
<tbody>
<tr>
<td>REV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIN1 Start</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIN2 Stop</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Figure 6. Start pulse/Stop pulse.](image)

The selections 4 to 6 shall be used to exclude the possibility of an unintentional start when, for example, power is connected, re-connected after a power failure, after a fault reset, after the drive is stopped by Run Enable (Run Enable = False) or when the control place is changed. The Start/Stop contact must be opened before the motor can be started.

4  DIN1: closed contact = start forward [Rising edge required to start]
DIN2: closed contact = start reverse [Rising edge required to start]

5  DIN1: closed contact = start [Rising edge required to start]
   open contact = stop
DIN2: closed contact = reverse
   open contact = forward

6  DIN1: closed contact = start [Rising edge required to start]
   open contact = stop
DIN2: closed contact = start enabled
   open contact = start disabled and drive stopped if running
2.2.1.2, 2.2.1.3  Test mode reference scaling, minimum value/maximum value

Setting value limits: $0 \leq \text{par. } 2.2.1.2 \leq \text{par. } 2.2.1.3 \leq \text{par. } 2.1.2$. If parameter $2.2.1.3 = 0$ scaling is set off. The minimum and maximum frequencies are used for scaling.

![Graph of Reference Scaling](image)

Figure 7. Left: Reference scaling; Right: No scaling used (par. 2.2.1.3 = 0).

2.2.1.4  Test mode reference inversion

Inverts reference signal:
Max. ref. signal = Min. set freq.
Min. ref. signal = Max. set freq.

0  No inversion
1  Reference inverted

![Graph of Reference Inversion](image)

Figure 8. Reference invert.

2.2.1.5  Test mode reference filter time

Filters out disturbances from the incoming analogue $U_{in}$ signal.
Long filtering time makes regulation response slower.

![Graph of Reference Filtering](image)

Figure 9. Reference filtering
6.2.2  **Digital inputs**

2.2.2.1  **Run enable**
- Contact open: Start of motor disabled
- Contact closed: Start of motor enabled

2.2.2.2  **Reverse**
- Contact open: Forward
- Contact closed: Reverse

2.2.2.3  **Fault reset**
- Contact closed: All faults are reset.

2.2.2.4  **External fault (close)**
- Contact closed: Fault is displayed and motor stopped

2.2.2.5  **External fault (open)**
- Contact open: Fault is displayed and motor stopped.

2.2.2.6  **Acceleration/Deceleration time selection**
- Contact open: Acceleration/Deceleration time 1 selected
- Contact closed: Acceleration/Deceleration time 2 selected

Set Acceleration/Deceleration times with parameters 2.1.3 and 2.1.4.

2.2.2.7  **Jogging speed**
- Contact closed: Jogging speed selected for frequency reference

See parameter 2.1.20

2.2.2.8  **Control from I/O terminal**
- Contact closed: Force control place to I/O terminal

2.2.2.9  **Control from keypad**
- Contact closed: Force control place to keypad

2.2.2.10  **Control from fieldbus**
- Contact closed: Force control place to fieldbus

**NOTE:** When the control place is forced to change the values of Start/Stop, Direction and Reference valid in the respective control place are used. The value of parameter 3.1 (Keypad Control Place) does not change. When the input opens the control place is selected according to keypad control parameter 3.1.
2.2.2.11 **Winder mode**
Contact open: Rewinder
Contact closed: Unwinder

DIN selection is updated to keypad if selection is A.1 or higher.

2.2.2.12 **Control mode**
Contact open: Speed control
Contact closed: Tension control

DIN selection is updated to keypad if selection is A.1 or higher.

2.2.2.13 **Enable web break detection**
When enabled, the drive generates a warning or an error when web break is detected. DIN selection is updated to keypad if selection is A.1 or higher.

2.2.2.14 **Speed release**
Speed limit remains in slack recovery until contactor is closed. Default value is 0.2 = TRUE

2.2.2.15 **Set preset radius**
Digital input command for setting the radius if parameter 2.12.1.7 is 0 or 2. Profibus has the same priority than the digital input.

2.2.2.16 **Web break**
Digital input for external web break monitoring. Input operational regardless of parameter 2.12.5.5

2.2.2.17 **DC Brake in stop**
When activated the drive uses the DC brake when in stop state. Motor current during stop state is tenth from parameter 2.4.8.

2.2.2.18 **Emergency Stop**
Digital input for emergency stop.
0 = Emergency stop
1 = Normal operation
6.3 Line references and actual signal selections

2.2.3.1 Line speed reference signal selection
2.2.4.1 Line tension reference signal selection
2.2.5.1 Line speed actual signal selection
2.2.6.1 Radius actual signal selection
2.2.7.1 Tension actual signal selection
2.2.8.1 Preset radius signal selection
2.2.9.1 Taper function signal selection

Connect the desired signal to the analogue input of your choice with this parameter. See chapter 2 Programming principle of the Input signals in Winder application.

2.2.3.2 Line speed reference filtering time
2.2.4.2 Line tension reference filtering time
2.2.5.2 Line speed actual filtering time
2.2.6.2 Radius actual filtering time
2.2.7.2 Tension actual filtering time

Giving this parameter a value greater than 0 activates the function that filters out disturbances from the incoming analogue signal. Long filtering time makes the regulation response slower.

2.2.3.3 Line speed reference signal range
2.2.4.3 Line tension reference signal range
2.2.5.3 Line speed actual signal range
2.2.6.3 Radius actual signal range
2.2.7.3 Tension actual signal range
2.2.8.2 Preset radius signal range
### 2.2.9.2 Taper function signal range

With these parameters you can select the signal range.

- **0** Signal range 0...10V, 0...20mA
- **1** Signal range 2...10V, 4...20mA
- **2** Customised signal range defined with parameters 2.2.x.4 and 2.2.x.5

---

**Figure 11. Reference scaling**

- **2.2.3.4 Line speed reference input minimum value**
- **2.2.3.5 Line speed reference input maximum value**
- **2.2.4.4 Line tension reference input minimum value**
- **2.2.4.5 Line tension reference input maximum value**
- **2.2.5.4 Line speed actual input minimum value**
- **2.2.5.5 Line speed actual input maximum value**
- **2.2.6.4 Radius actual input minimum value**
- **2.2.6.5 Radius actual input maximum value**
- **2.2.7.4 Tension actual input minimum value**
- **2.2.7.5 Tension actual input maximum value**
- **2.2.8.3 Preset radius input minimum value**
- **2.2.8.4 Preset radius input maximum value**
- **2.2.9.3 Taper function input minimum value**
2.2.9.4  Taper function input maximum value

Set the custom minimum and maximum levels for input signals within 0...10V or 0...20mA.

\[ \text{Set the custom minimum and maximum levels for input signals within 0...10V or 0...20mA.} \]

\[ \text{Parameter 2.2.x.4 = 0\%} \]

\[ \text{Parameter 2.2.x.4 = 100\%} \]

\[ \text{Parameter 2.2.x.4 = 50\%} \]

Note: Line speed actual values are not limited when 2.2.3.5 is less than 100%. Internal values are more than 100% when input is 10V or 20mA.

2.2.6.6  Line speed reference signal inversion

2.2.7.6  Line tension reference signal inversion

2.2.8.5  Line speed actual signal inversion

2.2.9.5  Radius actual signal inversion

2.2.9.5  Tension actual signal inversion

2.2.9.5  Preset radius signal inversion

2.2.9.5  Taper function signal inversion

0 = No inversion

1 = Signal inverted

\[ \text{Figure 12. Reference scaling} \]

\[ \text{Figure 13. Reference inversion} \]
2.2.3.7  **Line speed reference ramping rate**

With this parameter you can set ramping rate for internally used speed reference. This parameter can be used for stabilize inertia compensation. Note every other drive acc/deceleration time or line speed reference must be set accordingly.

2.2.9.7  **Taper function minimum reference**

2.2.9.8  **Taper function maximum reference**

With these parameters can be set limit for taper function tension reference.
6.4 Output signals

6.4.1 Digital outputs

All parameters of this group shall be programmed using the *Terminal to Function Programming method (TTF)*. In other words, all functions (parameters) that you wish to use shall be connected to a certain output on a certain option board. For more information, see Chapter 2,

2.3.1.1 *Ready*
The frequency converter is ready to operate.

2.3.1.2 *Run*
The frequency converter operates (the motor is running).
Default programming: A.1.

2.3.1.3 *Fault*
A fault trip has occurred.
Default programming: A.2.

2.3.1.4 *Inverted fault*
No fault trip has occurred.

2.3.1.5 *Overtemperature warning*
The heatsink temperature exceeds +70°C.

2.3.1.6 *External fault or warning*
Fault or warning depending on parameter 2.7.3.

2.3.1.7 *Reference fault or warning*
Fault or warning depending on parameter 2.7.1.

2.3.1.8 *Warning*
General warning signal.

2.3.1.9 *Reverse*
The Reverse command has been selected.

2.3.1.10 *Jogging speed*
The jogging speed command has been selected

2.3.1.11 *At speed*
The output frequency has reached the set reference.

2.3.1.12 *Motor regulator activation*
Over voltage or over current regulator has been activated.
2.3.1.13 **Output frequency limit 1 supervision**
The output frequency goes outside the set supervision low limit/high limit (see parameters 2.3.4.1 and 2.3.4.2)

2.3.1.14 **External control place**
Control from I/O terminal selected (Menu M3, par. 3.1).

2.3.1.15 **Thermistor warning**
Motor thermistor initiates a over temperature signal which can be led to a digital output.

NOTE: This parameter will not work unless you have Vacon NXOPTA3 or NXOPTB2 [thermistor relay board] connected.

2.3.1.16 **FB digital input 1**
Indication of status FieldBus digital input 1.

2.3.1.17 **Slack recovery ON**
Indication when slack recovery is operating.

2.3.1.18 **Slack recovery OFF**
Indication when slack recovery is operating, negated.

2.3.1.19 **Web Break fault/warning**
Web break fault or warning is active.

2.3.1.20 **Brake control**
Brake open command is given when drive has start command and it’s in run state. While in closed loop motor control also motor flux is monitored.

**Note:** Use ramping stop while using drive controlled brake.
6.4.2 Analogue output 1

2.3.2.1 Analogue output signal selection
Connect the A01 signal to the analogue output of your choice with this parameter.

2.3.2.2 Analogue output function
This parameter selects the desired function for the analogue output signal. See Table 16. Analogue output 2, G2.3 on page 20 for the parameter values.

2.3.2.3 Analogue output filter time
Defines the filtering time of the analogue output signal.

2.3.2.4 Analogue output invert
Inverts the analogue output signal:

Maximum output signal = Minimum set value
Minimum output signal = Maximum set value

See parameter 2.3.2.5 below.

2.3.2.5 Analogue output minimum
Defines the signal minimum to either 0 mA or 4 mA (living zero). Note the difference in analogue output scaling in parameter 2.3.5 (Figure 2-9).

0 Set minimum value to 0 mA
1 Set minimum value to 4 mA
2.3.2.6 Analogue output scale
Scaling factor for analogue output.

<table>
<thead>
<tr>
<th>Signal</th>
<th>Max. value of the signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output frequency</td>
<td>Max frequency (par. 2.1.2)</td>
</tr>
<tr>
<td>Freq. Reference</td>
<td>Max frequency (par. 2.1.2)</td>
</tr>
<tr>
<td>Motor speed</td>
<td>Motor nom. speed 1xnmotor</td>
</tr>
<tr>
<td>Output current</td>
<td>Motor nom. current 1IxMotor</td>
</tr>
<tr>
<td>Motor torque</td>
<td>Motor nom. torque 1xTnMotor</td>
</tr>
<tr>
<td>Motor power</td>
<td>Motor nom. power 1xPnMotor</td>
</tr>
<tr>
<td>Motor voltage</td>
<td>100% x U_nMotor</td>
</tr>
<tr>
<td>DC-link voltage</td>
<td>1000 V</td>
</tr>
</tbody>
</table>

Table 30. Analogue output scaling

6.4.3 Analogue output 2

2.3.3.1 Analogue output 2 signal selection
Connect the AO2 signal to the analogue output of your choice with this parameter. For more information, see Pump and fan control application manual, Chapter 2.

2.3.3.2 Analogue output 2 function
2.3.3.3 Analogue output 2 filter time
2.3.3.4 Analogue output 2 inversion
2.3.3.5 Analogue output 2 minimum
2.3.3.6 Analogue output 2 scaling

For more information on these five parameters, see the corresponding parameters for the analogue output 1 on pages 42 and 43.

6.4.4 Limit settings

2.3.4.1 Output frequency limit supervision function
0  No supervision
1  Low limit supervision
2  High limit supervision

If the output frequency goes under/over the set limit (P 2.3.4.2) this function generates a warning message via the digital output DO1 and via the relay output RO1 or RO2 depending on the setting of parameter 2.3.1.13.
2.3.4.2 *Output frequency limit supervision value*

Selects the frequency value supervised by parameter 2.3.4.2.

![Diagram](image)

*Figure 17. Output frequency supervision*
6.5 Drive control

2.4.1 Acceleration/Deceleration ramp 1 shape
2.4.2 Acceleration/Deceleration ramp 2 shape

The start and end of acceleration and deceleration ramps can be smoothed with these parameters. Setting value 0 gives a linear ramp shape which causes acceleration and deceleration to act immediately to the changes in the reference signal. Setting value 0 … 100 % for this parameter produces an S-shaped acceleration/deceleration. The acceleration time is determined with parameters 2.1.3/2.1.4 (2.4.3/2.4.4).

2.4.3 Acceleration time 2
2.4.4 Deceleration time 2

These parameters give you the possibility to set two different acceleration/deceleration time sets for one application. Connect the Acceleration time selection signal [parameter 2.2.2.6] to one of the digital inputs and choose the active Acceleration/Deceleration time by setting the contact open [Acc/Dec time 1] or close [Acc/Dec time 2].

2.4.5 Brake chopper

0 No brake chopper used
1 Brake chopper used and tested in Run state
2 External brake chopper
3 Used and tested in Ready state

When the frequency converter is decelerating the motor, the inertia of the motor and the load are fed into an external brake resistor. This enables the frequency converter to decelerate the load with a torque equal to that of acceleration (provided that the correct brake resistor has been selected). See separate Brake resistor installation manual.
2.4.6 Start function
Ramp:
0  The frequency converter starts from 0 Hz and accelerates to the set reference frequency within the set acceleration time. [Load inertia or starting friction may cause prolonged acceleration times].

Flying start:
1  The frequency converter is able to start into a running motor by applying a small torque to motor and searching for the frequency corresponding to the speed the motor is running at. Searching starts from the maximum frequency towards the actual frequency until the correct value is detected. Thereafter, the output frequency will be increased/decreased to the set reference value according to the set acceleration/deceleration parameters.

Use this mode if the motor is coasting when the start command is given. With the flying start it is possible to ride through short mains voltage interruptions.

2.4.7 Stop function
Coasting:
0  The motor coasts to a halt without any control from the frequency converter, after the Stop command.

Ramp:
1  After the Stop command, the speed of the motor is decelerated according to the set deceleration parameters. If the regenerated energy is high it may be necessary to use an external braking resistor for faster deceleration.

Normal stop: Ramp/ Run Enable stop: coasting
2  After the Stop command, the speed of the motor is decelerated according to the set deceleration parameters. However, when Run Enable is selected (e.g. DIN3), the motor coasts to a halt without any control from the frequency converter.

Normal stop: Coasting/ Run Enable stop: ramping
3  The motor coasts to a halt without any control from the frequency converter. However, when Run Enable signal is selected (e.g. DIN3), the speed of the motor is decelerated according to the set deceleration parameters. If the regenerated energy is high it may be necessary to use an external braking resistor for faster deceleration.

2.4.8 DC-braking current
Defines the current injected into the motor during DC-braking. When DC-braking in stop mode is selected (P2.2.2.17) current is tenth of this parameter.
2.4.9 **DC-braking time at stop**

Determines if braking is ON or OFF and the braking time of the DC-brake when the motor is stopping. The function of the DC-brake depends on the stop function, parameter 2.4.7.

0  DC-brake is not used

>0  DC-brake is in use and its function depends on the Stop function, (param. 2.4.7). The DC-braking time is determined with this parameter

2.4.10 **DC-braking frequency at stop**

The output frequency at which the DC-braking is applied.

**Par. 2.4.7 = 0; Stop function = Coasting:**

After the stop command, the motor coasts to a stop without control of the frequency converter.

With DC-injection, the motor can be electrically stopped in the shortest possible time, without using an optional external braking resistor.

The braking time is scaled according to the frequency when the DC-braking starts. If the frequency is $\geq$ the nominal frequency of the motor, the set value of parameter 2.4.9 determines the braking time. When the frequency is $\leq$10% of the nominal, the braking time is 10% of the set value of parameter 2.4.9.

![Figure 19. DC-braking time when Stop mode = Coasting.](NX12K21)
Par. 2.4.7 = 1; Stop function = Ramp:

After the Stop command, the speed of the motor is reduced according to the set deceleration parameters, as fast as possible, to the speed defined with parameter 2.4.10, where the DC-braking starts.

The braking time is defined with parameter 2.4.9. If high inertia exists, it is recommended to use an external braking resistor for faster deceleration. See Figure 20.

2.4.11 DC-braking time at start

DC-brake is activated when the start command is given. This parameter defines the time before the brake is released. After the brake is released, the output frequency increases according to the set start function by parameter 2.4.6.

2.4.12 Flux brake

The flux braking can be set ON or OFF.

0 = Flux braking OFF
1 = Flux braking ON

2.4.13 Flux braking current

Defines the flux braking current value. It can be set between 0.1 x \( I_{\text{Nom}} \) and the Current limit.

2.4.14 Zero speed level

Below this value speed is interpreted as zero speed. When selected speed goes below this value and start command is removed brake will close.

2.4.15 Monitored Speed

Select monitored speed for zero speed. When using reference note also parameter 2.7.26.

Note: Actual speed requires encoder on motor shaft.
**PROHIBIT FREQUENCIES**

2.5.1, 2.5.2 *Prohibit frequency area; Low limit/High limit*

In some systems it may be necessary to avoid certain frequencies because of mechanical resonance problems. With these parameters it is possible to set limits for the "skip frequency" region. See Figure 21.

![Figure 21. Prohibit frequency area setting.](image)

2.5.3 *Acc/dec ramp speed scaling ratio between prohibit frequency limits*

Defines the acceleration/deceleration time when the output frequency is between the selected prohibit frequency range limits (parameters 2.5.1 and 2.5.2). The ramping speed (selected acceleration/deceleration time 1 or 2) is multiplied with this factor. E.g. value 0.1 makes the acceleration time 10 times shorter than outside the prohibit frequency range limits.

![Figure 22. Ramp speed scaling between prohibit frequencies](image)
6.6 Motor control

Motor control mode is internally determined by logic speed or torque control. Select only control mode type.

When using NXS drive it is recommended to use the programmable U/f curve to have a good speed and torque accuracy when operating near zero frequency.

NXS drive uses mode 0 only while for NXP drive all control modes are available.

**Motor control mode**

- **0** Open loop NXS/NXP drive
- **1** Closed loop: NXP drive with encoder on motor shaft
- **2** Advanced open loop NXP drive without encoder

### 2.6.2 U/f optimisation

#### Automatic torque boost

The voltage to the motor changes automatically which makes the motor produce sufficient torque to start and run at low frequencies. The voltage increase depends on the motor type and power. Automatic torque boost can be used in applications where starting torque due to starting friction is high, e.g. in conveyors.

**EXAMPLE:**

What changes are required to start with load from 0 Hz?

- First set the motor nominal values (Parameter group 2.1).
- Motor Control Mode = 0 (Frequency control) and 1 (Speed control)

**Option 1:** Activate the Automatic torque boost (par. 2.6.2).

**Option 2:** Programmable U/f curve

To get torque you need to set the zero point voltage and midpoint voltage/frequency (in parameter group 2.6) so that the motor takes enough current at low frequencies. First set par. 2.6.3 to *Programmable U/F-curve* (value 2). Increase zero point voltage (P2.6.8) to get enough current at zero speed. Set then the midpoint voltage (P2.6.7) to 1.4142*P2.6.8 and midpoint frequency (P2.6.6) to value P2.6.7/100%*P2.1.7.

**NOTE!**

*In high torque - low speed applications - it is likely that the motor will overheat. If the motor has to run a prolonged time under these conditions, special attention must be paid to cooling the motor. Use external cooling for the motor if the temperature tends to rise too high.*
2.6.3 **U/f ratio selection**

When setting parameter for the programmable U/f-curve use test mode 1 at P2.12.6.

**Linear:** The voltage of the motor changes linearly with the frequency in the constant flux area from 0 Hz to the field weakening point where the nominal voltage is supplied to the motor. Linear U/f ratio should be used in constant torque applications. See Figure 23. This default setting should be used if there is no special need for another setting.

**Squared:** The voltage of the motor changes following a squared curve form with the frequency in the area from 0 Hz to the field weakening point where the nominal voltage is also supplied to the motor. The motor runs under magnetised below the field weakening point and produces less torque and electromechanical noise. Squared U/f ratio can be used in applications where torque demand of the load is proportional to the square of the speed, e.g. in centrifugal fans and pumps.

**Figure 23. Linear and squared change of motor voltage**

Programmable U/f curve:

2 The U/f curve can be programmed with three different points. Programmable U/f curve can be used if the other settings do not satisfy the needs of the application.
Linear with flux optimisation:

3 The frequency converter starts to search for the minimum motor current in order to save energy, lower the disturbance level and the noise. This function can be used in applications with constant motor load, such as fans, pumps etc.

2.6.4 Field weakening point

The field weakening point is the output frequency at which the output voltage reaches the set (par. 2.6.5) maximum value.

2.6.5 Voltage at field weakening point

Above the frequency at the field weakening point, the output voltage remains at the set maximum value. Below the frequency at the field weakening point, the output voltage depends on the setting of the U/f curve parameters. See parameters 2.6.2, 2.6.3, 2.6.6 and 2.6.7.

When the parameters 2.1.6 and 2.1.7 (nominal voltage and nominal frequency of the motor) are set, the parameters 2.6.4 and 2.6.5 are automatically given the corresponding values. If you need different values for the field weakening point and the maximum output voltage, change these parameters after setting the parameters 2.1.6 and 2.1.7.

2.6.6 U/f curve, middle point frequency

If the programmable U/f curve has been selected with the parameter 2.6.3 this parameter defines the middle point frequency of the curve. See Figure 24.

2.6.7 U/f curve, middle point voltage

If the programmable U/f curve has been selected with the parameter 2.6.3 this parameter defines the middle point voltage of the curve. See Figure 24.
2.6.8 **Output voltage at zero frequency**
If the programmable U/f curve has been selected with the parameter 2.6.3 this parameter defines the zero frequency voltage of the curve. See Figure 24.

2.6.9 **Switching frequency**
Motor noise can be minimised using a high switching frequency. Increasing the switching frequency reduces the capacity of the frequency converter unit.
The range of this parameter depends on the size of the frequency converter:

Up to NX5 0061: 1...16 kHz  
> NX5 0072: 1...10 kHz

2.6.10 **Overvoltage controller**
2.6.11 **Undervoltage controller**
These parameters allow the under-/overvoltage controllers to be switched out of operation. This may be useful, for example, if the mains supply voltage varies more than –15% to +10% and the application will not tolerate this over-/undervoltage. In this case, the regulator controls the output frequency taking the supply fluctuations into account.

**Note:** Over-/undervoltage trips may occur when controllers are switched out of operation.

0 Controller switched off  
1 Controller switched on, no ramping  
2 Controller switched on, ramping

If DC-voltage drops under 80% of DC nominal voltage, with undervoltage control mode 2, the drive will ramp down to zero speed.

2.6.12 **Speed limit positive**
Defines speed limit for positive direction.

2.6.13 **Speed limit negative**
Defines speed limit for negative direction.

2.6.14 **Motoring torque limit**
This parameter defines motoring torque limit or tension. Used in speed control to limit motor torque if line is suddenly locked up. In tension control defines maximum limit for tension torque.

This parameter don’t limit torque produced by inertia compensation.

**NOTE:** If parameter 2.12.2.4 Empty winder inertia is greater than zero this parameter acts as tension limit.

2.6.15 **Generating torque limit**
Same as motoring torque limit, but on generating side.
6.7 Protections

2.7.1 Monitored signal
With this parameter you can select which signal is monitored for reference fault

2.7.2 Response to reference fault
0 = No response
1 = Warning
2 = Warning, the frequency from 10 seconds back is set as reference
3 = Warning, the Preset Frequency (Par. 2.7.3) is set as reference
4 = Fault, stop mode after fault according to parameter 2.4.7
5 = Fault, stop mode after fault always by coasting

A warning or a fault action and message is generated if the 4…20 mA reference signal is used and the signal falls below 3.5 mA for 5 seconds or below 0.5 mA for 0.5 seconds. The information can also be programmed into digital output DO1 or relay outputs R01 and R02.

2.7.3 4 mA Fault: preset frequency reference
If the value of parameter 2.7.1 is set to 3 and the 4 mA fault occurs then the frequency reference to the motor is the value of this parameter.

2.7.4 Response to external fault
0 = No response
1 = Warning
2 = Fault, stop mode after fault according to parameter 2.4.7
3 = Fault, stop mode after fault always by coasting

A warning or a fault action and message is generated from the external fault signal (parameters 2.2.7.11 and 2.2.7.12) in the digital input selected. The information can also be programmed into the digital output or the relay outputs (par. 2.3.3.6).

2.7.5 Input phase supervision
0 = No response
1 = Warning
2 = Fault, stop mode after fault according to parameter 2.4.7
3 = Fault, stop mode after fault always by coasting

The input phase supervision ensures that the input phases of the frequency converter have an approximately equal current.

2.7.6 Response to undervoltage fault
1 = Warning
2 = Fault, stop mode after fault according to parameter 2.4.7
3 = Fault, stop mode after fault always by coasting

For the undervoltage limits see Vacon NX User’s Manual, Table 4-2.
2.7.7 Output phase supervision

0 = No response
1 = Warning
2 = Fault, stop mode after fault according to parameter 2.4.7
3 = Fault, stop mode after fault always by coasting

Output phase supervision of the motor ensures that the motor phases have an approximately equal current.

2.7.8 Earth fault protection

0 = No response
1 = Warning
2 = Fault, stop mode after fault according to parameter 2.4.7
3 = Fault, stop mode after fault always by coasting

Earth fault protection ensures that the sum of the motor phase currents is zero. The overcurrent protection is always working and protects the frequency converter from earth faults with high currents.

Parameters 2.7.9—2.7.13, Motor thermal protection:

General

The motor thermal protection is to protect the motor from overheating. The Vacon drive is capable of supplying higher than nominal current to the motor. If the load requires this high current there is a risk that the motor will be thermally overloaded. This is the case especially at low frequencies. At low frequencies the cooling effect of the motor is reduced as well as its capacity. If the motor is equipped with an external fan the load reduction at low speeds is small.

The motor thermal protection is based on a calculated model and it uses the output current of the drive to determine the load on the motor.

The motor thermal protection can be adjusted with parameters. The thermal current $I_T$ specifies the load current above which the motor is overloaded. This current limit is a function of the output frequency.

The thermal stage of the motor can be monitored on the control keypad display. See Vacon NX User’s Manual, Chapter 7.3.1.

CAUTION! The calculated model does not protect the motor if the airflow to the motor is reduced by blocked air intake grill.
2.7.9 **Motor thermal protection**

0 = No response  
1 = Warning  
2 = Fault, stop mode after fault according to parameter 2.4.7  
3 = Fault, stop mode after fault always by coasting  

If tripping is selected the drive will stop and activate the fault stage. Deactivating the protection, i.e. setting parameter to 0, will reset the thermal stage of the motor to 0%.

2.7.10 **Motor thermal protection: Motor ambient temperature factor**

When the motor ambient temperature must be taken into consideration, it is recommended to set a value for this parameter. The value of the factor can be set between –100.0% and 100.0% where –100.0% corresponds to 0°C and 100.0% to the maximum running temperature of the motor. Setting this parameter value to 0% assumes that the ambient temperature is the same as the temperature of the heatsink at power-on.

2.7.11 **Motor thermal protection: Zero frequency current**

The current can be set between 0—150.0% \times I_{nMotor}. This parameter sets the value for thermal current at zero frequency. See Figure 25.

The default value is set assuming that there is no external fan cooling the motor. If an external fan is used this parameter can be set to 90% (or even higher).

**Note:** The value is set as a percentage of the motor nameplate data, parameter 2.1.9 (Nominal current of motor), not the drive’s nominal output current. The motor's nominal current is the current that the motor can withstand in direct on-line use without being overheated.

If you change the parameter Nominal current of motor, this parameter is automatically restored to the default value. Setting this parameter does not affect the maximum output current of the drive, which is determined by parameter 2.1.5 alone.

![Figure 25. Motor thermal current \(I_T\) curve](image)
### 2.7.12 Motor thermal protection: Time constant

This time can be set between 1 and 200 minutes.

This is the thermal time constant of the motor. The bigger the motor, the bigger the time constant. The time constant is the time within which the calculated thermal stage has reached 63% of its final value.

The motor thermal time is specific to the motor design and it varies between different motor manufacturers.

If the motor’s \( t_6 \)-time (\( t_6 \) is the time in seconds the motor can safely operate at six times the rated current) is known (given by the motor manufacturer) the time constant parameter can be set basing on it. As a rule of thumb, the motor thermal time constant in minutes equals to \( 2 \times t_6 \). If the drive is in stop stage the time constant is internally increased to three times the set parameter value. The cooling in the stop stage is based on convection and the time constant is increased. See also Figure 26.

### 2.7.13 Motor thermal protection: Motor duty cycle

Defines how much of the nominal motor load is applied. The value can be set to 0%...100%.

---

![Figure 26. Motor temperature calculation](image-url)
Parameters 2.7.14—2.7.17, Stall protection:

General

The motor stall protection protects the motor from short time overload situations such as one caused by a stalled shaft. The reaction time of the stall protection can be set shorter than that of motor thermal protection. The stall state is defined with two parameters, 2.7.15 (Stall current) and 2.7.17 (Stall frequency). If the current is higher than the set limit and output frequency is lower than the set limit, the stall state is true. There is actually no real indication of the shaft rotation. Stall protection is a type of overcurrent protection.

### 2.7.14 Stall protection

- 0 = No response
- 1 = Warning
- 2 = Fault, stop mode after fault according to parameter 2.4.7
- 3 = Fault, stop mode after fault always by coasting

Setting the parameter to 0 will deactivate the protection and reset the stall time counter.

### 2.7.15 Stall current limit

The current can be set to 0.0…6000.0 A. For a stall stage to occur, the current must have exceeded this limit. See Figure 27. This value is set in percentage of the motor’s nameplate data (parameter 2.1.9). If the parameter 2.1.9 Nominal current of motor is changed, this parameter is automatically restored to the default value.

![Figure 27. Stall characteristics settings](image-url)
2.7.16  **Stall time**

This time can be set between 1.0 and 120.0s. This is the maximum time allowed for a stall stage. The stall time is counted by an internal up/down counter. If the stall time counter value goes above this limit the protection will cause a trip (see parameter 2.7.14).

![Figure 28. Stall time count](image)

2.7.17  **Maximum stall frequency**

The frequency can be set between 1–f_{max} (par. 2.1.2). For a stall state to occur, the output frequency must have remained below this limit.

Parameters 2.7.18—2.7.21, **Underload protection:**

**General**

The purpose of the motor underload protection is to ensure that there is load on the motor when the drive is running. If the motor loses its load there might be a problem in the process, e.g. a broken belt or a dry pump.

Motor underload protection can be adjusted by setting the underload curve with parameters 2.7.19 (Field weakening area load) and 2.7.20 (Zero frequency load), see below. The underload curve is a squared curve set between the zero frequency and the field weakening point. The protection is not active below 5Hz (the underload time counter is stopped).

The torque values for setting the underload curve are set in percentage which refers to the nominal torque of the motor. The motor’s name plate data, parameter motor nominal current and the drive’s nominal current I_{H} are used to find the scaling ratio for the internal torque value. If other than nominal motor is used with the drive, the accuracy of the torque calculation decreases.

2.7.18  **Underload protection**

0 = No response  
1 = Warning  
2 = Fault, stop mode after fault according to parameter 2.4.7  
3 = Fault, stop mode after fault always by coasting

If tripping is set active the drive will stop and activate the fault stage. Deactivating the protection by setting the parameter to 0 will reset the underload time counter to zero.
2.7.19 Underload protection, field weakening area load

The torque limit can be set between 10.0—150.0 % x TnMotor.
This parameter gives the value for the minimum torque allowed when the output frequency is above the field weakening point. See Figure 29.

If you change the parameter 2.1.9 (Motor nominal current) this parameter is automatically restored to the default value.

![Figure 29. Setting of minimum load](image)

2.7.20 Underload protection, zero frequency load

The torque limit can be set between 5.0—150.0 % x TnMotor.
This parameter gives value for the minimum torque allowed with zero frequency. See Figure 29.
If you change the value of parameter 2.1.9 (Motor nominal current) this parameter is automatically restored to the default value.

2.7.21 Underload time

This time can be set between 2.0 and 600.0 s.

*This is the maximum time allowed for an underload state to exist. An internal up/down counter counts the accumulated underload time. If the underload counter value goes above this limit the protection will cause a trip according to parameter 2.7.18. If the drive is stopped the underload counter is reset to zero. See Figure 30.*
2.7.22 **Response to thermistor fault**

0 = No response  
1 = Warning  
2 = Fault, stop mode after fault according to parameter 2.4.7  
3 = Fault, stop mode after fault always by coasting

Setting the parameter to 0 will deactivate the protection and reset the stall time counter.

2.7.23 **Response to fieldbus fault**

Set here the response mode for the fieldbus fault if a fieldbus board is used. For more information, see the respective Fieldbus Board Manual.

See parameter 2.7.22.

2.7.24 **Response to slot fault**

Set here the response mode for a board slot fault due to missing or broken board.

See parameter 2.7.22.

2.7.25 **Fieldbus watchdog delay**

If this value is greater than zero and there is no maintenance pulse from fieldbus B11, fieldbus fault is activated. See setting profibus.

2.7.26 **Brake operation in system fault**

In some faults drive can’t make ramming stop. On those situations drives ramp generator is zeroed which causes brake to close immediately. With this parameter application leaves break open if drive is in coasting stop on fault situations.

2.7.27 **Pt-100 Numbers**

2.7.28 **Pt-100 Fault response**
2.7.29  
*Pt-100 Warning limit*

2.7.30  
*Pt-100 Fault limit*

2.7.31  
*Emergency stop mode*

0 = Coasting stop  
1 = Defined by system P2.4.7  
2 = Ramping

2.7.32  
*Emergency stop ramp time*

When emergency stop is active drive will use this parameter ramp time to stop.
6.8 Auto restart parameters

2.8.1 Automatic restart: Wait time
Defines the time before the frequency converter tries to automatically restart the motor after the fault has disappeared.

2.8.2 Automatic restart: Trial time
The Automatic restart function restarts the frequency converter when the faults selected with parameters 2.8.4 to 2.8.10 have disappeared and the waiting time has elapsed.

![Diagram of Automatic restart with two restarts](image)

Parameters 2.8.4 to 2.8.10 determine the maximum number of automatic restarts during the trial time set by parameter 2.8.2. The time count starts from the first autoreset. If the number of faults occurring during the trial time exceeds the values of parameters 2.8.4 to 2.8.10, the fault state becomes active. Otherwise the fault is cleared after the trial time has elapsed and the next fault starts the trial time count again.

If a single fault remains during the trial time, a fault state is true.

2.8.3 Automatic restart, start function
The Start function for Automatic restart is selected with this parameter. The parameter defines the start mode:

- 0 = Start with ramp
- 1 = Flying start
- 2 = Start according to par. 2.4.6
2.8.4  **Automatic restart: Number of tries after undervoltage fault trip**

This parameter determines how many automatic restarts can be made during the trial time set by parameter 2.8.2 after an undervoltage trip.

- **0** = No automatic restart after undervoltage fault trip
- **>0** = Number of automatic restarts after undervoltage fault. The fault is reset and the drive is started automatically after the DC-link voltage has returned to the normal level.

2.8.5  **Automatic restart: Number of tries after overvoltage trip**

This parameter determines how many automatic restarts can be made during the trial time set by parameter 2.8.2 after an overvoltage trip.

- **0** = No automatic restart after overvoltage fault trip
- **>0** = Number of automatic restarts after overvoltage fault. The fault is reset and the drive is started automatically after the DC-link voltage has returned to the normal level.

2.8.6  **Automatic restart: Number of tries after overcurrent trip**

[NOTE! IGBT temp Fault also included]

This parameter determines how many automatic restarts can be made during the trial time set by parameter 2.8.2.

- **0** = No automatic restart after overcurrent fault trip
- **>0** = Number of automatic restarts after overcurrent trip, saturation trip and IGBT temperature faults.

2.8.7  **Automatic restart: Number of tries after reference trip**

This parameter determines how many automatic restarts can be made during the trial time set by parameter 2.8.2.

- **0** = No automatic restart after reference fault trip
- **>0** = Number of automatic restarts after the analogue current signal (4...20 mA) has returned to the normal level (>4 mA)

2.8.8  **Automatic restart: Number of tries after motor temperature fault trip**

This parameter determines how many automatic restarts can be made during the trial time set by parameter 2.8.2.

- **0** = No automatic restart after Motor temperature fault trip
- **>0** = Number of automatic restarts after the motor temperature has returned to its normal level.
2.8.9  **Automatic restart: Number of tries after external fault trip**

This parameter determines how many automatic restarts can be made during the trial time set by parameter 2.8.2.

<table>
<thead>
<tr>
<th>0</th>
<th>No automatic restart after External fault trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;0</td>
<td>Number of automatic restarts after External fault trip</td>
</tr>
</tbody>
</table>
6.9 Closed loop parameters

The following parameters are used in Vacon NXP only.

Full torque control at zero speed cannot be maintained without feedback. When a speed error of less than 0.5% or full torque control at all speeds is required in the application, motor control based on feedback from an encoder is an absolute necessity. This capability is incorporated into the NXP.

In addition to the current measurement system used in the NXS, the NXP utilises feedback values from the encoder. The enhanced microprocessor provided with the NXP is capable of fast calculations.

The NXP control unit can be used for closed loop applications requiring high precision and for open loop applications requiring high dynamic performance.

*Note! For closed loop applications, NXOPTA4 or NXOPTA5 has to be installed.*

2.9.1 Magnetising current

Set here the rated magnetizing current for the motor. This parameter is used for adjusting the motor in no-load condition.

2.9.2 Speed control Kp

Sets the gain for the speed controller in % per Hz.

2.9.3 Speed control Ti

Sets the integral time constant for the speed controller

2.9.4 Load drooping

The drooping function enables speed drop as a function of load. The amount of allowed speed drop is proportional to the load or speed controller output (lq reference). This parameter sets that amount corresponding to 100% load of the motor.

2.9.5 Acceleration compensation

Sets the inertia compensation to improve speed response during acceleration and deceleration. Time is defined as acceleration time to nominal speed with nominal torque. This parameter is active also in advanced open loop mode.

2.9.6 Slip adjust

The motor name plate speed is used to calculate the nominal slip. This value should be used to adjust motor voltage when loaded. Reducing the slip adjust value increases the motor voltage when the motor is loaded.

2.9.7 Start, magnetizing current

Set here the magnetizing current to reduce flux building time during start.

2.9.8 Start, magnetizing time

Time for start magnetisation current.
2.9.9 **Start zero speed time**
After giving the start command the drive will remain at zero speed for the time defined by this parameter. The ramp will be released to follow the set frequency/speed reference after this time is elapsed from the instant where the command is given.

2.9.10 **Stop zero speed time**
The drive will remain at zero speed with controllers active for the time defined by this parameter after reaching the zero speed when a stop command is given.

2.9.11 **Start up torque**
Startup torque is used to reduce erratic motion after start. Torque Memory is used in crane applications. Startup Torque FWD/REV can be used in other applications to help speed controller.

- 0 = Not Used
- 1 = TorqMemory
- 2 = Torque Ref
- 3 = Torq.Fwd/Rev

2.9.12 **Start-up torque forward**
Sets the start-up torque for forward direction if selected with par 2.10.11.

2.9.13 **Start-up torque reverse**
Sets the start-up torque for reverse direction if selected with par 2.10.11.

2.9.14 **Encoder P/R**
Select here the encoder pulse number.

2.9.15 **Encoder 1, filter time**
Sets the filter time constant for speed measurement.

2.9.16 **Encoder supervision**
Encoder supervision activates the encoder fault if encoder pulses are missing. If the motor is mechanically stalled due to an external process, the supervision must be turned off.

2.9.17 **Current control Kp**
Sets the gain for the current controller. This controller is active only in closed loop and advanced open loop modes. The controller generates the voltage vector reference to the modulator.

2.9.18 **Identification**
Detects the motor parameters automatically if the motor is started within 20 seconds after activation of this parameter.

For open loop control modes use mode 1 and closed loop control modes use mode 2.

24-hour support +358 (0)40 837 1150 • Email: vacon@vacon.com
6.10 Advanced open loop parameters

If the value of par. 2.6.1 = 2, the advanced open loop mode is selected. Winder application speed control mode uses advanced open loop with slip compensation. These modes are designed e.g. for lift and hoisting applications to give smoother operation with less tuning required. The operation is based on current control mode at low frequencies. Above a certain frequency limit, the operation is under standard V/Hz control. At low frequencies the motor current is adjusted between minimum current and zero speed current according to the load in order to maintain the flux. In the frequency corner, the U/f-boost parameter is used to optimise motor current and torque.

2.10.1 Zero speed current
At very low frequencies this parameter defines the constant current reference to the motor.

2.10.2 Minimum current
Minimum current to the motor in the current control frequency region. Larger value gives more torque, but increases losses.

2.10.3 Flux reference
Reference for flux below frequency limit. Larger value gives more torque, but increases losses.

2.10.4 Frequency limit
Corner frequency for transition to standard V/Hz control in % of motor nominal frequency.

2.10.5 U/f-boost
Boost voltage at Frequency Limit to increase flux and torque.
6.11 Monitor settings

2.11.1 Can Bus node number
Only for NXP-drive when using NCSysDrive.

6.12 Winder parameters

6.12.1 Basic parameters

2.12.1.1 Minimum Radius
Value of empty winder radius. The value must be specified in percent of maximum diameter. Allowed range is 10 to 100%.

2.12.1.2 Winder Mode
This parameter controls the operation mode of the winder:
0 = Rewinder
1 = Unwinder
The operation mode can be controlled by a programmable digital input. In this case, the DI input takes priority over the value of Par. 2.12.1.2. Mode can be selected also from fiedbus, and selected mode is updated to panel.

2.12.1.3 Control mode
This parameter enables tension/speed control.
0 = Speed control
1 = Tension control
The operation mode can be controlled by a programmable digital input. In this case, the DI input takes priority over the value of Par. 2.12.1.3. Mode can be selected also from fiedbus, and selected mode is updated to panel.

2.12.1.4 Calculated radius filtering time
The parameter defines the filtering time for calculated radius, which is useful in line speed control when the actual motor speed is changing rapidly due to the speed controller in closed loop control. This parameter has no effect when radius is measured.

2.12.1.5 Radius ramping time
This parameter specifies the response rate of the ramp filter at the output of the radius calculator block. One unit stands for 1% change rate per second. Allowed range is 1%/s to 10%/s. The parameter has no effect when radius is measured.

2.12.1.6 Radius holding RPM
Minimum RPM of operation for the radius calculator. When the speed corresponding to actual line speed or motor actual speed is lower than this threshold, the radius calculator holds the last value until the speed is increased higher than the threshold again. For NXS drive it is recommended to use higher values.
2.12.1.7 **Radius reset mode**

The parameter defines the manner the radius value is reset to the initial value (Par. 2.12.1.1 in rewind mode, 100.0% in unwind mode) or using preset value.

- **0** = On command, value of radius is reset only when resetting command is given.
- **1** = Reset on start, value of radius is reset only when the drive goes to run mode
- **2** = Reset on command to preset radius
- **3** = Reset on start to preset radius

In case of power breakdown the radius value is stored in memory.

2.12.1.8 **Preset radius**

Give preset radius if preset radius source is keypad P2.1.18.

2.12.1.9 **RPM addition to speed limit function**

This value is added to calculated speed reference to calculated speed limit. E.g. if set to 100 rpm in case of web break (rewinder modes) the motor speed will increase by only 100 rpm. The drive will generate web break fault in certain time (P 2.12.5.4) at the speed limit frequency.

2.12.1.10 **Speed limited by calculated radius**

With this parameter its possible to disable speed limit function. In case of web break motor speed may increase up to maximum frequency.

2.12.1.11 **Test mode**

- **0** = Winder mode
- **1** = Open Loop frequency test. Drive use frequency reference selected with Par. 2.1.11 (I/O Reference). Minimum and maximum frequencies are used for scaling. See also Par. 2.2.1.2 and Par. 2.2.1.

The drive is working under frequency reference. This mode can be used for setting the programmable U/f curve.

- **2** = Control mode with direct reference

Speed control and 3 Closed loop control modes use frequency reference selected with Par. 2.1.11 (I/O Reference). Minimum and maximum frequencies are used for scaling. See also Par. 2.2.1.2 and Par. 2.2.1.3

---

Tel. +358 (0)201 2121 • Fax +358 (0)201 212 205
Torque control and 4 closed loop control modes uses line tension reference, panel tension reference aren’t accepted, if selected torque reference is set to zero. Torque reference is scaled from 0% \( T_N \) to Par. 2.12.2.3 (Full scale torque). Friction and/or inertia torque are added to final torque reference.

Note: While in tension control, motor speed is limited via speed reference.

3 = Direct reference.

Control place must be Fieldbus and control mode closed loop control mode. Speed and torque reference are taken from fieldbus.

Speed ref. = FB Speed reference = 10000 = 100% = Motor nominal frequency

Torque ref. = Tension reference = 10000 = 100% = Motor nominal torque

References are signed, negative reference gives negative speed and torque

Torque control mode is selected by MainControlWord.B5.

6.12.2 Tension control

2.12.2.1 Static friction compensation

Value of constant torque term, which is added to (in rewind mode) or subtracted (in unwind mode) from the torque reference to compensate static friction. The allowed range is 0 to 25% of motor torque.

2.12.2.2 Viscous friction compensation

Torque term proportional to motor speed, which is added to (in rewind mode) or subtracted from (in unwind mode) the reference to compensate viscous friction. The parameter specifies value at full motor speed, which is at max line speed and minimum radius. The allowed range is 0 to 25% of rated motor torque.

2.12.2.3 Full scale torque

This parameter specifies the amount of torque required when tension reference is at full scale and radius equals maximum (100%). The unit is percent of motor rated torque.

Inertia compensation

Speed reference value is used for inertia compensation. When tension controlled drive speed reference is changed the torque reference must change so that a correct tension can be maintained. The line speed reference is used for calculating this correction of torque reference. An approximate formula to calculate correct value for inertia compensation and a table for adjusting these values below.

<table>
<thead>
<tr>
<th></th>
<th>Tension is too small</th>
<th>Tension is too high</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unwind</td>
<td>Rewind</td>
</tr>
<tr>
<td>Accelerating</td>
<td>Value is too high</td>
<td>Value is too low</td>
</tr>
<tr>
<td>Decelerating</td>
<td>Value is too low</td>
<td>Value is too high</td>
</tr>
</tbody>
</table>

*Table 31. Commissioning inertia parameters.*

24-hour support +358 (0)40 837 1150 • Email: vacon@vacon.com
2.12.2.4 **Empty winder inertia**

Value of inertia corresponding to the empty winder reel (Radius = min, Par.2.12.1.1), as seen from the motor shaft, and including the motor and gearbox terms. The value is specified in percent of motor base inertia (V1.2.21).

\[ J_{\text{min}}\% = \frac{J_{\text{min}}[\text{kgm}^2]}{J_{\text{base}}[\text{kgm}^2]} \]

2.12.2.5 **Full winder inertia**

Value of inertia of the winder fully loaded with material (diameter = 100%), as seen at the motor shaft, and including the motor and gearbox terms. Value is specified as percent of Drive base inertia (V1.2.21). Range is 0 to 3276.7 % (note that values >> 100% are fairly common for direct drive winders).

\[ J_{\text{max}}\% = \frac{J_{\text{max}}[\text{kgm}^2]}{J_{\text{base}}[\text{kgm}^2]} \]

2.12.2.6 **Taper radius**

This parameter specifies the % radius at which the tension starts to change linearly from the input reference when the non-zero taper is applied. See P 2.12.2.7.

2.12.2.7 **Taper reference**

Keypad taper tension reference. The tension reference which is added to final tension reference at maximum radius starting from taper radius P2.12.2.6. See Figure 32.

![Figure 32. Taper function](image)

6.12.3 **Tension PI control**

Tension PI control is activated when actual tension source is selected.

2.12.3.1 **Tension control gain**

This parameter defines the gain of the PID controller. If the value of the parameter is set to 100% a change of 10% in the error value causes the controller output to change by 10%. If the parameter value is set to 0 the PID controller operates as ID-controller.
2.12.3.2  

_Tension control integration time_

The parameter 2.12.3.2 defines the integration time of the PID controller. If this parameter is set to 1,00 second a change of 10% in the error value causes the controller output to change by 10.00%/s. If the parameter value is set to 0.00 s the PID controller will operate as PD controller.

2.12.3.3  

_Pl control minimum output_

2.12.3.4  

_Pl control maximum output_

With these parameters you can set the minimum and maximum limits for the PID controller output. Values in percent of torque.

6.12.4  

_Slack recovery_

2.12.4.1  

_Slack recovery speed reference_

In speed control, this parameter acts as speed reference for slack recovery, until the Time at slack recovery speed (P2.12.4.3) and/or the Speed releasing torque limit are reached.

In tension control, the rewinder operation is the same as in speed control. In tension controlled unwinder mode, the parameter defines the speed limit for rewinder direction.

While the drive is in slack recovery mode the control mode is speed control.

Using high speeds may cause web rapture due to winder inertia.

Using this parameter is greatly dependable on how U/F curve is defined when using open loop control mode.

2.12.4.2  

_Speed release acceleration time_

This parameter defines the acceleration time from 0 to maximum frequency after slack recovery. When value is zero drive uses normal acceleration times.

2.12.4.3  

_Minimum time at slack recovery frequency_

This is the minimum duration of staying at slack recovery speed until the speed releasing torque limit can unfreeze the limit.

2.12.4.4  

_Speed releasing torque limit_

Minimum torque, which must be reached before the frequency reference or torque reference can reach its operating level.

If parameter 2.12.2.3 full-scale torque is greater than zero this parameter represents the percentage of line tension.
6.12.5  Winder faults

Web break monitoring

Web break monitoring monitors the output frequency. When the output frequency is greater than the calculated speed limit the time to web break timer is activated. Web break monitoring principle is that the radius cannot change into wrong direction. In line speed control the limit is reached when the calculated radius changes into wrong direction. In line tension control a web break can be noticed clearly because a line break causes speed to run away. When the radius is measured in line speed control and line break appears speed stays same. Then it is possible to use underload protection.

2.12.5.1  Web break response

Web break can be noticed only in rewinder mode. Unwinder will automatically go to slack recovery reference in case of web break.

1 = No Action
2 = Warning
3 = Fault, stop mode defined with Par. 2.4.7

2.12.5.2  Rewinding stop mode

2.12.5.3  Unwinding stop mode

0 = Coasting
1 = Stop mode defined with Par. 2.4.7
2 = Ramping

2.12.5.4  Time to web break response

Time at web break condition until the action defined with P2.12.5.1 is performed. If time is zero web break monitoring is disabled.

2.12.5.5  Actual line speed fault limit

If line speed actual goes below this value while motor is running faster than radius-holding speed it is interpreted as web break.
6.13 Setting profibus

Use mode “ByPass” with winder application for NXP. See PROFIBUS DP OPTION BOARD manual for detail information.

6.13.1 Winder for NXP Control Word

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
<th>Value = 0</th>
<th>Value = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Stop by coast</td>
<td>ON 1</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Emergency stop</td>
<td>Normal operation</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>STOP</td>
<td>START</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Forward winding</td>
<td>Reverse winding</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Rewinding</td>
<td>Unwinding</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Speed control</td>
<td>Tension control</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>No Action</td>
<td>FAULT RESET (0 -&gt; 1)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>No Action</td>
<td>Jogging speed</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>No Action</td>
<td>Direct speed control</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Disable Profibus control</td>
<td>Enable Profibus control</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Fielbus Watchdog pulse 0.5 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>No Action</td>
<td>Reset radius command (0 -&gt; 1)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>No Action</td>
<td>Web break input command</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 32. Winder for NXP control word

B0 = Motor is stopped always by coast when 1 > 0.
B1 = Drive goes to emergency stop state when 1 > 0. Emergency stop fault can be reset only when B1 = True and start command is FALSE.
B3 = Reverse command for:
- Normal winding
- Jogging speed
- OL Freq test
- OL CL test
B5 = Selection for line speed/tension control.
While in OL freq test, OL CL test or Direct Ref. Motor control can be change between speed and torque control.
B9 = When B9 = TRUE and control place is fielbus. Motor control mode is changed to speed control and drive fallows motor speed reference from fielbus.
6.13.2  **Winder Process Data In**

<table>
<thead>
<tr>
<th>Data</th>
<th>Value</th>
<th>Unit</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>FB Speed reference</td>
<td>Motor speed ref.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process data IN 1</td>
<td>Line speed reference</td>
<td>%</td>
<td>0,01 %</td>
</tr>
<tr>
<td>Process data IN 2</td>
<td>Line tension reference</td>
<td>%</td>
<td>0,01 %</td>
</tr>
<tr>
<td>Process data IN 3</td>
<td>Line speed actual</td>
<td>%</td>
<td>0,01 %</td>
</tr>
<tr>
<td>Process data IN 4</td>
<td>Radius actual</td>
<td>%</td>
<td>0,01 %</td>
</tr>
<tr>
<td>Process data IN 5</td>
<td>Line tension actual</td>
<td>%</td>
<td>0,01 %</td>
</tr>
<tr>
<td>Process data IN 6</td>
<td>Preset radius</td>
<td>%</td>
<td>0,01 %</td>
</tr>
<tr>
<td>Process data IN 7</td>
<td>Taper reference</td>
<td>%</td>
<td>0,01 %</td>
</tr>
<tr>
<td>Process data IN 8</td>
<td>Not used</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Table 33. Winder Process Data In*

6.13.3  **Winder for NXP Status Word**

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
<th>Value = 0</th>
<th>Value = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not ready</td>
<td>Not ready</td>
<td>Ready</td>
</tr>
<tr>
<td>1</td>
<td>Stop</td>
<td>Stop</td>
<td>Running</td>
</tr>
<tr>
<td>2</td>
<td>Ready</td>
<td>Ready</td>
<td>Fault</td>
</tr>
<tr>
<td>3</td>
<td>Normal winding</td>
<td>Normal winding</td>
<td>Slack recovery active</td>
</tr>
<tr>
<td>4</td>
<td>Run disabled</td>
<td>Run disabled</td>
<td>Run enabled</td>
</tr>
<tr>
<td>5</td>
<td>Rewinder</td>
<td>Rewinder</td>
<td>Unwinder</td>
</tr>
<tr>
<td>6</td>
<td>Speed control</td>
<td>Speed control</td>
<td>Tension control</td>
</tr>
<tr>
<td>7</td>
<td>No Action</td>
<td>No Action</td>
<td>Emergency stop active</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Fielbus Watchdog pulse 0.5 Hz</td>
<td>Fielbus Watchdog pulse 0.5 Hz</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 34. Winder for NXP Status Word*
6.13.4 **Fieldbus data out selections 1 to 8**

Using these parameters, you can monitor any monitoring or parameter from the fieldbus. Enter the ID number of the item you wish to monitor for the value of these parameters.

Some typical values:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Output frequency</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Motor speed</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>Motor current</td>
<td>17</td>
</tr>
<tr>
<td>4</td>
<td>Motor torque</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>Motor power</td>
<td>26</td>
</tr>
<tr>
<td>6</td>
<td>Motor voltage</td>
<td>37</td>
</tr>
<tr>
<td>7</td>
<td>DC link voltage</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Unit temperature</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Motor temperature</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>AI1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>AI2</td>
<td></td>
</tr>
</tbody>
</table>

*Table 35. FB typical values.*

### 6.14 Keypad control parameters

#### 3.1 Control Place

The active control place can be changed with this parameter. For more information, see Vacon NX User’s Manual, Chapter 7.3.3.1.

Pushing the **Start button** for 3 seconds selects the control keypad as the active control place and copies the Run status information (Run/Stop, direction and reference).

#### 3.2 Keypad Test mode frequency reference

The frequency reference can be adjusted from the keypad with this parameter.

The output frequency can be copied as the keypad reference by pushing the **Stop button** for 3 seconds when you are on any of the pages of menu **M3**. For more information, see Vacon NX User’s Manual, Chapter 7.3.3.2.

#### 3.3 Keypad line speed reference

The line speed reference can be adjusted from the keypad with this parameter.

#### 3.4 Keypad line tension reference

The line tension reference can be adjusted from the keypad with this parameter.
3.5  Keypad Direction

0  Forward: The rotation of the motor is forward, when the keypad is the active control place.
1  Reverse: The rotation of the motor is reversed, when the keypad is the active control place.

For more information, see Vacon NX User’s Manual, Chapter 7.3.3.3.

3.6  Stop button activated

If you wish to make the Stop button a "hotspot" which always stops the drive regardless of the selected control place, give this parameter the value 1.

See also parameter 3.1.
7. CONTROL SIGNAL LOGIC IN WINDER APPLICATION

Figure 33. Control signal logic of the Winder Application

24-hour support +358 (0)40 837 1150 • Email: vacon@vacon.com
8. **FAULT CODES**

The fault codes, their causes and correcting actions are presented in the table below. The shadowed faults are A faults only. The items written in white on black background present faults for which you can program different responses in the application. See parameter group Protections.

**Note:** When contacting distributor or factory because of a fault condition, always write down all texts and codes on the keypad display.

<table>
<thead>
<tr>
<th>Fault code</th>
<th>Fault</th>
<th>Possible cause</th>
<th>Correcting measures</th>
</tr>
</thead>
</table>
| 1          | Over current         | Frequency converter has detected too high a current (>4*I_n) in the motor cable:  
  - sudden heavy load increase  
  - short circuit in motor cables  
  - unsuitable motor            | Check loading.  
Check motor.  
Check cables. |
| 2          | Over voltage         | The DC-link voltage has exceeded the limits.  
  - too short a deceleration time  
  - high overvoltage spikes in supply | Make the deceleration time longer. Use brake chopper or brake resistor (available as options) |
| 3          | Earth fault          | Current measurement has detected that the sum of motor phase current is not zero.  
  - insulation failure in cables or motor | Check motor cables and motor. |
| 5          | Charging switch      | The charging switch is open, when the START command has been given.  
  - faulty operation  
  - component failure | Reset the fault and restart.  
Should the fault re-occur, contact the distributor near to you. |
| 6          | Emergency stop       | Stop signal has been given from the option board. | Cannot be reset from the keypad.  
Switch off power.  
DO NOT RE-CONNECT POWER!  
Contact factory.  
If this fault appears simultaneously with Fault 1, check motor cables and motor |
| 7          | Saturation trip      | Various causes, e.g. defective component | Cannot be reset from the keypad.  
Switch off power.  
DO NOT RE-CONNECT POWER!  
Contact factory.  
If this fault appears simultaneously with Fault 1, check motor cables and motor |
| 8          | System fault         | - component failure  
  - faulty operation  
  Note exceptional fault data record. | Reset the fault and restart.  
Should the fault re-occur, contact the distributor near to you. |
| 9          | Under voltage        | DC-link voltage is under the voltage limits.  
  - most probable cause: too low a supply voltage  
  - frequency converter internal fault | In case of temporary supply voltage break reset the fault and restart the frequency converter. Check the supply voltage. If it is adequate, an internal failure has occurred. Contact the distributor near to you. |
<p>| 10         | Input line supervision | Input line phase is missing. | Check supply voltage and cable. |
| 11         | Output phase supervision | Current measurement has detected that there is no current in one motor phase. | Check motor cable and motor. |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Causes</th>
<th>Actions</th>
</tr>
</thead>
</table>
| 12   | Brake chopper supervision                                                  | - no brake resistor installed  
- brake resistor is broken  
- brake chopper failure                                              | Check brake resistor.  
If the resistor is ok, the chopper is faulty. Contact the distributor near to you.         |
| 13   | Frequency converter under temperature                                       | Heat sink temperature is under –10°C                                                                             |                                                                                                   |
| 14   | Frequency converter over temperature                                        | Heat sink temperature is over 90°C.  
Over temperature warning is issued when the heat sink temperature exceeds 85°C.               | Check the correct amount and flow of cooling air.  
Check the heat sink for dust.  
Check the ambient temperature.  
Make sure that the switching frequency is not too high in relation to ambient temperature and motor load. |
| 15   | Motor stalled                                                               | Motor stall protection has tripped.                                                                              | Check motor.                                                                                     |
| 16   | Motor over temperature                                                      | Motor overheating has been detected by frequency converter motor temperature model. Motor is overloaded.          | Decrease the motor load.  
If no motor overload exists, check the temperature model parameters.                               |
| 17   | Motor under load                                                            | Motor under load protection has tripped.                                                                          |                                                                                                   |
| 22   | EEPROM checksum fault                                                      | Parameter save fault  
- faulty operation  
- component failure                                                            | Reset the fault and restart.  
Should the fault re-occur, contact the distributor near to you.                                  |
| 25   | Microprocessor watchdog fault                                               | - faulty operation  
- component failure                                                            | Reset the fault and restart.  
Should the fault re-occur, contact the distributor near to you.                                  |
| 26   | Start-up prevented                                                          | Start-up of the drive has been prevented.                                                                        | Cancel prevention of start-up.                                                                   |
| 29   | Thermistor fault                                                            | The thermistor input of option board has detected increase of the motor temperature                              | Check motor cooling and loading  
Check thermistor connection  
(If thermistor input of the option board is not in use it has to be short circuited)       |
| 32   | Fan cooling                                                                 | Cooling fan of the frequency converter does not start, when ON command is given                                | Contact the distributor near to you.                                                               |
| 34   | CAN bus communication                                                       | Sent message not acknowledged.                                                                                    | Ensure that there is another device on the bus with the same configuration.                       |
| 36   | Control unit                                                                | NXS Control Unit can not control NXP Power Unit and vice versa                                                    | Change control unit                                                                               |
| 37   | Device change                                                               | Option board changed.  
Different power rating of drive.                                                                                   | Reset  
*Note: No fault time data record!*                                                                |
| 38   | Device added                                                                | Option board added.  
Drive of different power rating added.                                                                                 | Reset  
*Note: No fault time data record!*  
Reset  
*Note: No fault time data record!*                                                                |
| 39   | Device removed                                                              | Option board removed.  
Drive removed.                                                                                                   | Reset  
*Note: No fault time data record!*  
Reset  
*Note: No fault time data record!*                                                                |
<p>| 40   | Device unknown                                                              | Unknown option board or drive.                                                                                   | Contact the distributor near to you.                                                               |</p>
<table>
<thead>
<tr>
<th></th>
<th>IGBT temperature</th>
<th>IGBT Inverter Bridge over temperature protection has detected too high a short term overload current</th>
<th>Check loading. Check motor size.</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Brake resistor over temperature</td>
<td>Brake resistor over temperature protection has detected too heavy braking</td>
<td>Set the deceleration time longer. Use external brake resistor.</td>
</tr>
<tr>
<td>43</td>
<td>Encoder fault</td>
<td>Note the exceptional Fault data record. Additional codes: 1 = Encoder 1 channel A is missing 2 = Encoder 1 channel B is missing 3 = Both encoder 1 channels are missing 4 = Encoder reversed</td>
<td>Check encoder channel connections. Check the encoder board.</td>
</tr>
<tr>
<td>50</td>
<td>Analogue input Io &lt; 4mA (sel. signal range 4 to 20 mA)</td>
<td>Current at the analogue input is &lt; 4mA.  - control cable is broken or loose  - signal source has failed</td>
<td>Check the current loop circuitry.</td>
</tr>
<tr>
<td>51</td>
<td>External fault</td>
<td>Digital input fault.</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Keypad communication fault</td>
<td>The connection between the control keypad and the frequency converter is broken.</td>
<td>Check keypad connection and possible keypad cable.</td>
</tr>
<tr>
<td>53</td>
<td>Fieldbus fault</td>
<td>The data connection between the fieldbus Master and the fieldbus board is broken</td>
<td>Check installation. If installation is correct contact the nearest Vacon distributor.</td>
</tr>
<tr>
<td>54</td>
<td>Slot fault</td>
<td>Defective option board or slot</td>
<td>Check board and slot. Contact the nearest Vacon distributor.</td>
</tr>
<tr>
<td>80</td>
<td>Web break</td>
<td>1. Web is broken. 2. Wrong parameters 3. Control signal is broken</td>
<td>Check line. Check parameters. Check connections.</td>
</tr>
<tr>
<td>81</td>
<td>Emergency Stop</td>
<td>1. Digital input 2. MainControlWord.B1</td>
<td>Remove run command and reset fault</td>
</tr>
</tbody>
</table>

Table 36. Fault codes
**HEAD OFFICE AND PRODUCTION:**

**Väasa**
Vacon Plc
Runsorintie 7
65380 Väasa
firstname.lastname@vacon.com
telephone: +358 (0)201 2121
diary: +358 (0)201 212 205

**PRODUCTION:**

**Suzhou, China**
Vacon Suzhou Drives Co. Ltd.
Building 13CD
428 Xinglong Street
Suchun Industrial Square
Suzhou 215126
telephone: +86 512 6283 6630
diary: +86 512 6283 6618

**Vacon Traction Oy**
Vehnämyllynkatu 18
33980 Tampere
telephone: +358 (0)201 2121
diary: +358 (0)201 212 710

**SALES COMPANIES AND REPRESENTATIVE OFFICES:**

**FINLAND**

**Helsinki**
Vacon Plc
Äyritie 12
01510 Vantaa
telephone: +358 (0)201 212 600
fax: +358 (0)201 212 699

**Tampere**
Vacon Plc
Vehnämyllynkatu 18
33580 Tampere
telephone: +358 (0)201 2121
diary: +358 (0)201 212 750

**AUSTRALIA**

Vacon Pacific
17, Corporate Ave.
Rowville, Victoria 3178
telephone: +61 (03) 92139300
fax: +61 (03) 92139310

**AUSTRIA**

Vacon AT Antriebssysteme GmbH
Aumühlweg 21
2544 Leobersdorf
telephone: +43 2256 651 66
fax: +43 2256 651 66 66

**BELGIUM**

Vacon Benelux NV/SA
Interleuvenlaan 62
3001 Heverlee (Leuven)
telephone: +32 (0)16 394 825
fax: +32 (0)16 394 827

**CHINA**

Vacon Suzhou Drives Co. Ltd.
Beijing Office
A205, Grand Pacific Garden Mansion
8A Guanhua Road
Beijing 100026
telephone: +86 10 6581 3734
fax: +86 10 6581 3754

**FRANCE**

Vacon France
ZAC du Fresne
1 Rue Jacquard – BP72
91280 Saint Pierre du Perray CDIS
telephone: +33 (0)1 69 88 40 30
fax: +33 (0)1 69 81 60 40

**GERMANY**

Vacon GmbH
Gladbecker Strasse 425
45299 Essen
telephone: +49 (0)201 806 700
fax: +49 (0)201 806 7099

**INDIA**

Vacon India
Flat no T1, 3rd floor
VNS Ashok Apartment
Plot no. 9A, New Beach Road
Thiruvanmiyur
Chennai-600041
Tel. +91 44 245 150 18

**ITALY**

Vacon S.p.A.
Via F.Lii Guerra, 35
42100 Reggio Emilia
telephone: +39 0522 276811
fax: +39 0522 276890

**THE NETHERLANDS**

Vacon Benelux BV
Weide 40
2006 CJ Gorinchem
telephone: +31 (0)183 642 970
fax: +31 (0)183 642 971

**NORWAY**

Vacon AS
Langgata 2
0380 Holmestrand
telephone: +47 330 96120
fax: +47 330 96130

**RUSSIA**

ZAO Vacon Drives
Bolshaja Jakimanka 31,
109180 Moscow
telephone: +7 (095) 974 14 47
fax: +7 (095) 974 15 54

ZAO Vacon Drives
Zya Sovetskaya 7, office 210A
191036 St. Petersbourg
telephone: +7 (812) 332 1114
fax: +7 (812) 279 9053

**SPAIN**

Vacon Drives Ibérica S.A.
Miquel Servet, 2. P.I. Bufalvent
08243 Manresa
telephone: +34 93 877 45 06
fax: +34 93 877 00 09

**SWEDEN**

Vacon AB
Torget 1
172 67 Sundbyberg
telephone: +46 (0)8 293 055
fax: +46 (0)8 290 755

**THAILAND**

Vacon South East Asia
335/32 5th-6th floor
Srinakarin Road, Prawet
Bangkok 10250
Tel. +66 (0)85100 7090

**UNITED ARAB EMIRATES**

Vacon Middle East and Africa
Block A, Office 4A 226
P.O.Box 54763
Dubai Airport Free Zone
Dubai
Tel. +971 (0)4 204 5200
Fax: +971 (0)4 204 5203

**UNITED KINGDOM**

Vacon Drives (UK) Ltd.
18, Maizefield
Hinckley Fields Industrial Estate
Hinckley
LE10 1YF Leicestershire
telephone: +44 (0)1455 611 515
fax: +44 (0)1455 611 517

Vacon distributor: